This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

3 3433 06273403 7

Popular

POPULAR MECHANICS

SHOP NOTES

FOR

1919

EASY WAYS TO DO HARD THINGS

OF DAILY USE
TO EVERY MECHANIC

Vol. XV—Table of Contents, Pages 3095-3110

POPULAR MECHANICS, CHICAGO

COPYRIGHT, 1919 BY H. H. WINDSOR

THE NEW YORK
PUBLIC LIBRARY
147163A
ASTOR, LENOX AND
TILDEN FOUNDATIONS
R 1924 L

Copyright 1919
by
H. H. WINDSOR

Building A Fast Nineteen-Foot Runabout

By B. FRANCIS DASHIELL

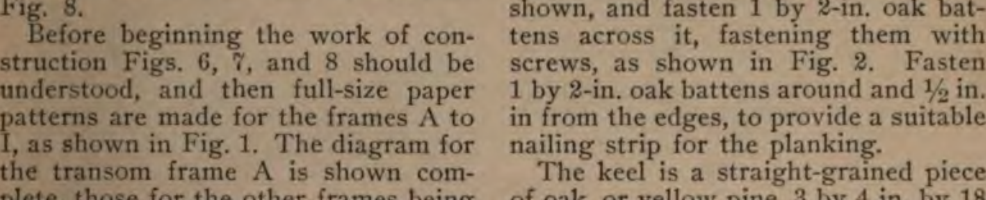
SEAWORTHINESS in rough water, simplicity and strength of construction, and fair speed with comparatively low power, are features of the small runabout motorboat, shown in the illustrations and detailed in the working drawings. It is of the V-bottom type, and the high, flaring bow enables it to cut the water with slight pounding or spray. A light-weight motor of 4 hp. is satisfactory, and for greater speed one of not over 8 hp. may be installed with a proper margin of safety, and freedom from excessive vibration. The deck plan is shown in Fig. 7 of the page plate; the structural framework in Fig. 6 in plan, and in a vertical section from bow to stern, in Fig. 8.

Before beginning the work of construction Figs. 6, 7, and 8 should be understood, and then full-size paper patterns are made for the frames A to I, as shown in Fig. 1. The diagram for the transom frame A is shown complete, those for the other frames being given in half section only. Make the frames, other than the transom, of 1 by 3-in. straight-grained oak. The two parts of each side section are bolted together with a 1-in. piece, 5 in. wide, called a knee, and the two side sections are joined at the keel by means of bolts and a heel, 1½ in. thick, as shown in Figs. 3 and 5. The fastenings are made with ⅜-in. bolts, fitted with washers and nuts. Inspect the frames to make certain that they are not twisted, and mark them A, B, etc., as indicated.

The stern frame, or transom, shown in Fig. 2, as viewed in section at J-K, Figs. 7 and 8, is made of oak, cypress, or pine, preferably in one piece, and 1½ in. thick. Two boards for it may be doweled, as shown in Fig. 1. Paint the pins and joined edges with marine glue, and clamp the pieces together to dry. Then shape the transom as shown, and fasten 1 by 2-in. oak battens across it, fastening them with screws, as shown in Fig. 2. Fasten 1 by 2-in. oak battens around and ½ in. in from the edges, to provide a suitable nailing strip for the planking.

The keel is a straight-grained piece of oak, or yellow pine, 3 by 4 in. by 18 ft., as shown in Figs. 6 and 8. Lay it out on a suitable level area for the fitting and assembling of the frames. They are notched over it, as shown in

FIG. 1



Sectional Diagrams of the Transom and Frames: To be Laid Out Full Size on Paper Patterns, to Which the Pieces are Fitted Accurately detail in Fig. 5, and bolted into place through the heel. Countersink the bolt heads. Line the frames up perfectly or trouble will be experienced in producing the desired contour and balance in the craft. Where the propeller shaft extends through or near the keel, it is necessary to fix the frames with two bolts straddling the shaft, as detailed in Fig. 3.

The shape and construction of the stem post, the stem and stern knees, and the method of fastening them into place are shown in Fig. 8, and in detail in Figs. 2 and 9. These parts may often be supplied to the best advantage by dealers in boat stock, in the natural crook, which is most desirable. They may also be built up as shown. To prevent the water from working into the seams of these parts at the joints of the stem and knee, stopwaters are used, as indicated in Fig. 8, and detailed in Fig. 9. They are plugs or dowels of white pine, dipped in marine glue. The stem and knees are bolted to the keel with ½-in. bolts, after painting the joints with glue.

Cut a rabbet, or planking groove, into the stem and stem knee, to provide a suitable nailing support for the planking, as indicated by the dotted line in Fig. 8, and in the stem detail, Fig. 9. Make the rabbet ½ in. deep, to bring the surface of the rabbeted parts flush with that of the planking. The upper corners of the keel are beveled to fit against the garboard, or lower plank, as shown in Fig. 5.

Brace the assembled frame temporarily, and strongly enough to withstand twisting strains. Turn the frame over so that the keel is uppermost, and level it carefully, for the nailing of the planking. The system of planking used is shown in Figs. 2 to 5, and in detail in Fig. 9. The best size for the planks is in lengths of 20 ft. 6 in., so as to give a minimum of end joints. Where short lengths are used, the joints should be supported on blocks on the inside, and the planks butted together. The planking, dressed on both sides, is ½ by 2½ in., though the width may vary slightly, preferably less than this width. Put on the garboard, next to the keel, first, and fit it to the bevel on the keel, as shown in Figs. 4 and 5. Fit the ends of each plank to the transom and into the rabbet at the stem post. The planks are fitted alternately on opposite sides of the hull. Their edges are beveled slightly to form a close fit on the inside, and to provide a space for calking the seams. Nail the garboards into place against the keel by means of wire finishing nails, sunk edgewise through the plank, as shown in Figs. 5 and 9. Fasten the planks to the transom and the stem post with nails or screws, galvanized, or of brass. Fit the planks carefully to the frame. At the chine strake, as indicated in Fig. 4, it may be necessary to trim the sharp corner slightly to produce a good fit for the planks, as shown in the chine detail in Fig. 9. After all of the planks have been put on, plane the top plank, or sheer strake, flush with the upper ends of the frames. Then turn the hull over on its keel, supporting it with braces. The woodwork of the upper portion may now be installed in part.

Notch the frames to receive a 1 by 3-in. filler piece of oak or pine behind the coaming, as shown in Fig. 3 and in the coaming detail, Fig. 9. Make the coaming of ½ by 6-in. oak, fitting the pieces for it into place only temporarily at first. The position of the coaming at the ends of the cockpit is shown in Fig. 8. The side decking is of ½-in. oak, or cypress, fastened with brass screws. Fill in the corners with quarter-round molding, as shown in Fig. 9. The forward and rear decks are of the same material, and are supported on deck beams fixed across the hull, as shown in Fig. 8.

The shaft log and engine bed shoul
then be located. The position of t
engine is about 7 ft. aft of the bow.
exact location will vary with differ
types and sizes of engines, and sho
be determined carefully to give
proper stability. The engine is mo
on bed timbers bolted to the fram
keel. The engine shaft is carrie
wooden shaft log, fixed on the

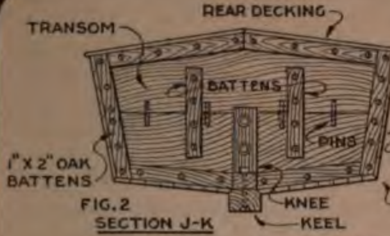


FIG. 2
SECTION J-K

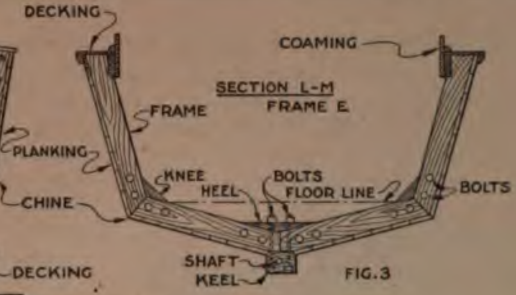


FIG. 3

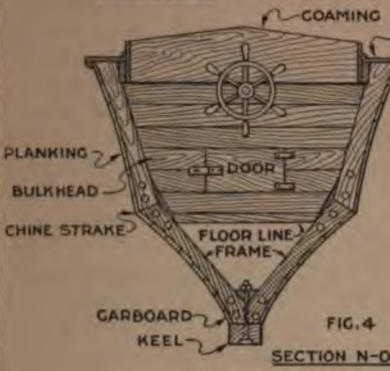


FIG. 4
SECTION N-O

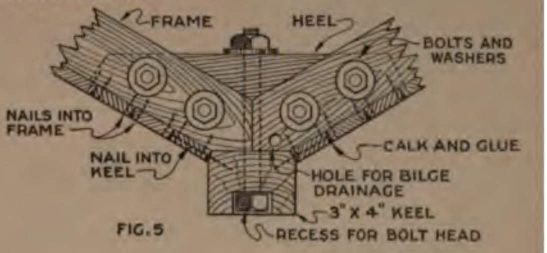


FIG. 5

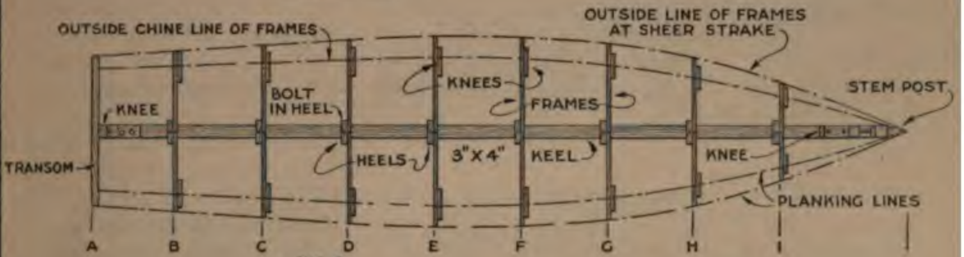


FIG. 6

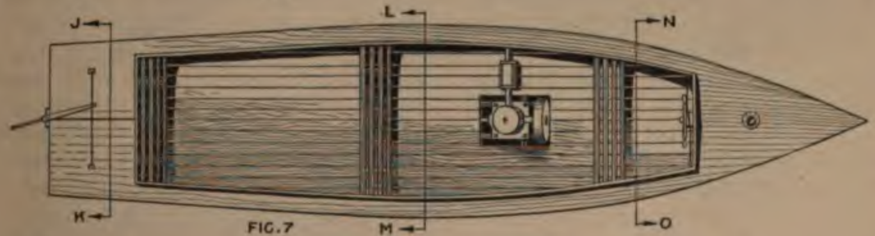


FIG. 7

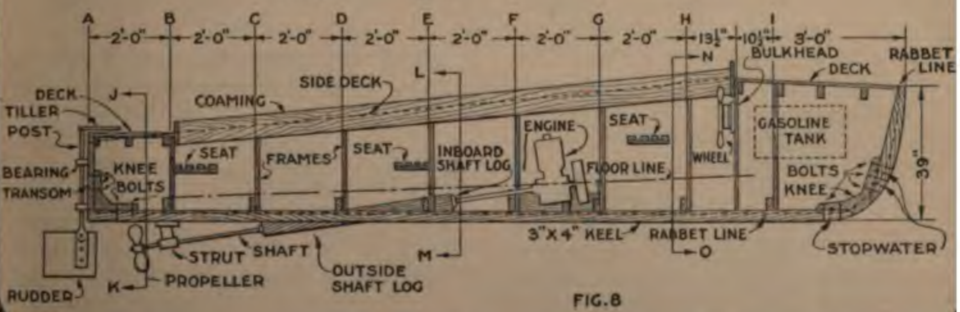


FIG. 8

This Motorboat Runabout was Designed as a Light Craft of Fair Speed with Low Power. The Constructi
of the Framework and Other Details Is Comparatively Simple, and Feasible for the Home Mechanic. T
General Arrangement of the Framework and Main Working Parts is Shown in Figs. 6 and 8, and the D
Plan in Fig. 7

and the outside of the keel, as shown in Fig. 8. If desired, the hole through the shaft log may be bored at a mill which may have furnished the keel and other special wooden parts. Metal stuffing boxes are fitted to the ends of the shaft log, and the joint of the shaft log and keel is made water-tight with marine glue or white lead, and bolted, as shown in Fig. 3.

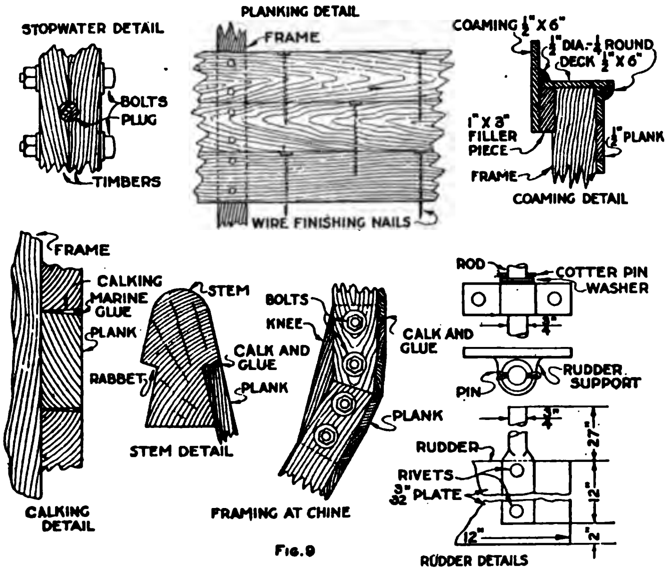


Fig. 9

Details for the Rudder, Coaming, Stopwater Plug, and Other Constructional Features

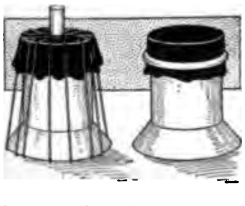
The cockpit is finished with flooring and siding, and bulkheads are built at the stern and the bow. The stern bulkhead is made by paneling the frame B, and the forward bulkhead, by building in a partition, as shown in Fig. 8, and in detail in Fig. 4. The siding for the cockpit is nailed to the frames, and the flooring to 1 by 3-in. floor beams. The seams of the decking are calked with marine glue.

The calking of the hull must be done thoroughly to insure that the craft will be seaworthy. Twisted calking cotton is tamped into the seams, as shown in the calking detail, Fig. 9, by means of a calking iron. The calking is covered with a ⅛-in. layer of black marine glue. Soften the glue by heating it in a water-jacket container, and force it well into the seams, overfilling them slightly. The glue does not become very hard, and when set, the hull should be scraped, removing excess glue. The outside should be given two coats of oil primer, and two of finishing paint. Paint the interior parts also, creosote or asphaltum paint being preferable for this purpose. The cockpit should be painted first with an oil primer and then with a finishing coat. The coaming and decks may be finished with paint or several coats of spar varnish.

The general arrangement of the fittings is shown in Figs. 7 and 8. The metal fittings may best be purchased, but some of them may be made if desired. The location of the gasoline tank in the bow, the seats of wooden strips, the steering wheel, propeller and connections, and the method of fixing the rudder into place, are shown in Fig. 8. A detail of the rudder and its supports is shown in Fig. 9. The rudder is controlled from the wheel by means of wire-reinforced rope extending from a cross arm at the top of the rudder shaft, around the coaming, and through pulleys to the wheel drum.

Making Cupped Leather Piston Washers

Leather washers, cupped to fit the piston of a pump, were required to make a repair, and were made quickly as follows: The pump barrel was 1½ in. in diameter, and the disks were cut ¾ in. larger in diameter. A spool of a diameter two thicknesses of the leather less than 1½ in. was used to form the wash-

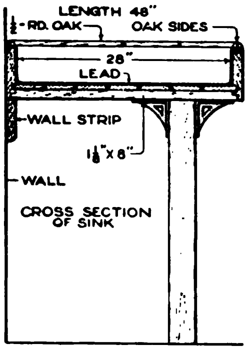


ers, as shown in the sketch. The washer is moistened and tied over the spool, centered with a pencil in putting on the strings, and then placed on the same or another spool with a metal ring or strong cord to hold it, as shown at the right, and permitted to dry into shape.—Herbert Consterdine, Hammond, La.

Ridding a Garage of Automobile Exhaust Gas

The exhaust gas from an automobile proved offensive in a closed garage and the difficulty was remedied by installing a pipe with a hose connection to the exhaust pipe of the car, and connecting it to the chimney. This method can be applied to garages having no chimney by the installation of a suitable flue, or outlet.—J. M. Straughan, Sprague, Wash.

Sink for Washing Blueprints

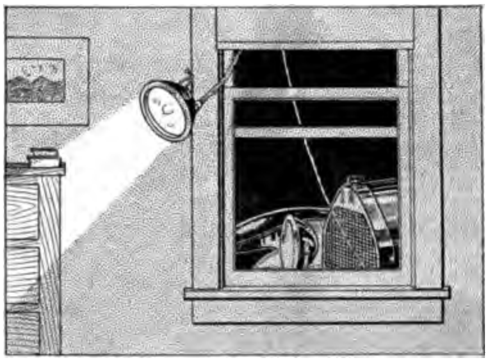


The blueprint sink detailed in the sketch is simple in construction and practical in use. Four pieces, preferably oak, are made for the sides and ends. A groove is planed near the lower edge so that the tongue-and-groove bottom will fit in all the way around. This groove supports the bottom, and provides for shrinkage and expansion, avoiding buckling of the lead lining. Two cross strips are screwed to the under side, and a leg is fastened to each by means of brackets. The lead lining is fitted, and the upper edges turned over, and tacked down. Half-round strips are nailed over the lead, and the woodwork finished as desired.

¶A spool cut at the middle provides two useful knobs.

Headlight as Emergency Lamp for Operating Room

A surgeon found it necessary to perform an operation after dark, in a town where commercial electric light current was unavailable. As an open light should not be used in a room where an anesthetic is administered, the electric headlight of an automobile was made to serve. The car was run up to the window of the room; the reflector and bulb from one of the headlights were removed, and after hanging the reflector over the operating table, the wires were run through the window and connections made. To assure proper results, the system was tested carefully, and it was made certain that the storage battery was fully charged. An extra bulb was provided, in case the one in use should burn out. The light proved quite satisfactory, the reflector shading the eyes of the operators, and concentrating the light on a small area, as desired.—Harry M. Kennard, Charles City, Ia.



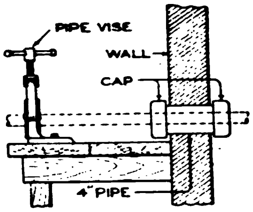
An Emergency Surgical Operation was Performed by the Aid of an Automobile Light

Raising Level of Gasoline in a Blowtorch

When the gasoline level is low in a blowtorch the pressure causes an excess of air in the burner supply pipe, blowing out the flame. In an emergency, a little water poured into the gasoline will cause the latter to float to a high enough level to operate the torch satisfactorily.

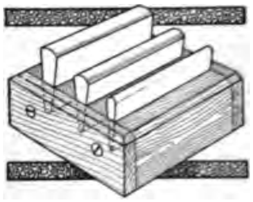
Handling Long Pipes in a Small Shop

Pipes, long rods, and similar pieces, are difficult to handle in a small shop. A 4-in. pipe, fitted through the wall of a small plumber's shop, made it possible to thread pipes of considerable length without bringing them into the shop. The pipes were drawn through the opening in the wall and clamped at one end, as shown. To thread the opposite end it was necessary only to reverse the pipe. When the opening was not in use, its ends were covered with pipe caps.—W. P. Langreich, New York, N. Y.



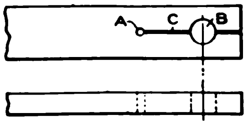
Holder for Slip Stones

Slip stones of good quality are fairly expensive, and easily broken if left to lie about the bench or machine. They may be kept safely and conveniently in a block like that shown. The grooves of several sizes are chiseled into the block, which is as long as the longest stone to be fitted into it. The ends are guarded with strips of wood.—Henry Wedde, Chicago, Ill.



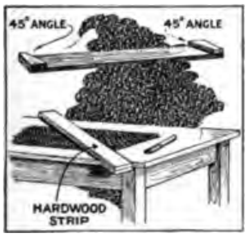
Cutting Porcelain Insulators

Considerable difficulty was experienced in cutting round porcelain insulators used in electrical work. The job was satisfactorily accomplished as follows: A piece of flat, cold-rolled steel, twice as wide as the diameter of the insulators and of the same thickness as the smaller insulators desired, was procured. A small hole, A, was drilled through it, and a slot C cut from the end to the hole, with a hacksaw. The hole B was drilled the same size as the insulators. The latter were then clamped in the hole B, in a vise. With a blow of a hammer on a cold chisel, set on the upper surface of the steel strip, the insulators were cut neatly, and to the proper height, the same as the thickness of the strip. In half an hour, 500 insulators were cut, with only eight damaged ones. Carrying on this method of cutting under water, produced better edges on the insulators.—George N. Garrison, East Orange, N. J.



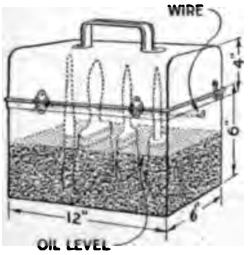
Device for Cutting Tire Fabric on Bias

A wet knife instead of shears is used in cutting tire fabric on the bias in a large plant. A straightedge of hard wood, to which two 45° guide blocks are fastened, reaches across the table, as shown, and is used as a guide in cutting. The straightedge is held at the proper angle by keeping the guide blocks against the edges of the table.



Painter's Brush Preserver and Carrier

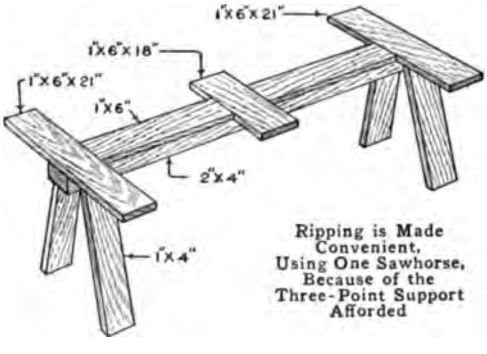
A wood finisher and painter constructed the receptacle shown in the sketch to keep his paintbrushes in good condition, and also for use in carrying them to and from his work. The container is 12 by 6 by 6 in. in size. It is fitted with a raised cover, 4 in. deep, hinged to one side. The cover is built to fit inside the container somewhat like the cover of a dinner pail. Two hooks hold it i place, when h [illegible] means a han



middle of each end, about 1 in. from the top edge. A stiff wire is passed through the two holes, leaving a little to spare at each end. Holes are bored through the handles of the brushes and the latter strung upon the wire. Sufficient oil or turpentine is poured in to immerse the bristles completely.—L. B. Robbins, Harwich, Mass.

General-Utility Sawhorse

A sawhorse which will serve the purposes that two ordinary sawhorses serve in many instances is shown in the sketch. It may be built quickly of stock timber, and of a size suited to particular needs, the dimensions indicated being suitable for work of average size in carpentry. If desired, the construction may be made more permanent by fastening the pieces together with screws, making housed joints where the legs are fixed to the main piece, and bracing them securely below. A convenient height for the sawhorse is 22 in., and a length of about 8 ft. is satisfactory. The work is supported on this device at three points when ripping, making the frequent shifting of the board to get a solid backing unnecessary. The center board is made shorter than the end pieces, so that it will not interfere in ripping, yet give a support at the middle. This is especially handy in ripping long narrow strips.—Harry Simon, Laguna Beach, Calif.



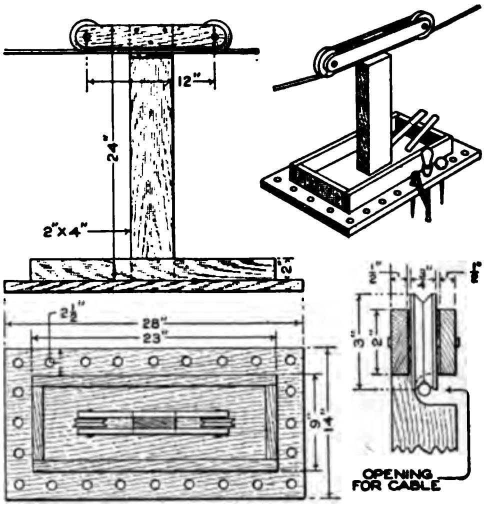
Ripping is Made Convenient, Using One Sawhorse, Because of the Three-Point Support Afforded

---

Oiling of bearings by an occasional of oil is wasteful and inefficient.

Trolley Tool Rack for Shop or Laboratory

A trolley tool rack made up of a tray suspended from a two-wheeled hanger on a rod or stiff wire is convenient in bringing tools to the point where the work in hand is being done. The device may be placed above a long bench or adjacent to a row of machines, and has other uses even in such work as electrical installations. The rack proper consists of a board, ⅞ by 14 by 28 in., around the edge of which holes of various sizes are bored for the tools. A frame, 2 in. high, provides a tray. A piece of 2 by 4-in. stuff supports the tray from the hanger.—R. E. Edward, Seattle, Wash.



The Tool Rack and Tray is Moved to the Point Where the Tools are Needed by Shifting It on the Cable

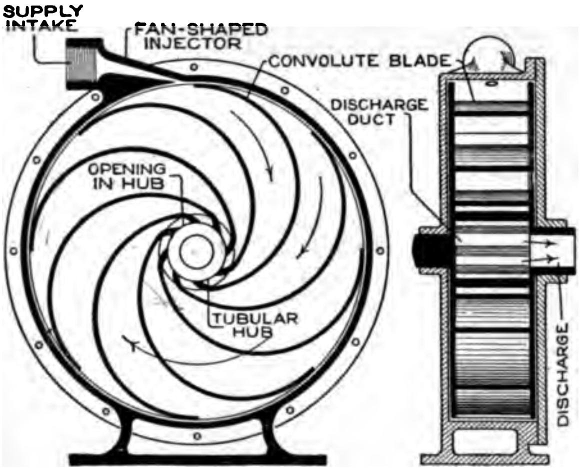
---

Preventing Breaking of Plaster by Door Knobs

A 6-in. square of sheet cork, or composition, of the same thickness as the plaster, may be used, at the point of contact, to prevent the breaking of plastered walls by door knobs when no stops are provided at the floor. This method was used with success in a repair job and the patches of composition board were painted over the same color as the wall.—E. L. Thomas, Pittsburgh, Pa.

An Adhesion and Impulse Engine

The rotary-fan type of power mechanism shown in the illustration was designed and built to apply a moving jet of steam economically to a set of blades, making use of the impulsive force as well as the adhesion of the gas in contact with the peculiarly shaped blades. A jet of steam is forced at high pressure into the chamber from the fan-shaped injector connected to the supply intake. The steam comes into contact with the convolute blades and is carried toward the center of the chamber where the blades converge, passing out into the discharge tube. The curve of the blades is such that the maximum rotary propulsive force is obtained from the steam pressing against them. The device develops a relatively high power on the shaft, the openings through which the steam escapes being designed so that the gas is held in the chamber under sufficient pressure to produce the maximum power, without retaining it long enough to permit condensation.



Steam is Forced from the Injector at High Pressure, and, by Adhesion as Well as Impulse on the Convolute Blades, Relatively High Power is Developed

The chamber is built up of a metal shell, having a circular plate riveted to its open side, and bearings cast as part of the shell and cover, as shown in the sectional view at the right. The injector is fitted in the top of the chamber and is fan-shaped, the width of the chamber. The revolving wheel, housed in the chamber, is of sheet metal and fitted with a solid shaft on the left side, as shown in the sectional view, and a hollow hub, for the discharge of the steam, on the right. Eight convolute blades are fitted between the side plates of the wheel, and openings are provided between them to permit the steam to escape into the hub discharge tube.

The steam enters the chamber under pressure and is forced against the outer edge of the convolute blades, reacting against the curve and being carried toward the hub. I have obtained very high speeds with the device, and this seeming disadvantage was readily overcome by increasing the proportionate size of the wheel. It has given satisfactory results as a water motor, and when the wheel is well under way, and the chamber is filled with water in revolution, the power derived has been found to be large in proportion to the water pressure. This is caused by the centrifugal action of the water, the resulting power being applied largely upon the curved blades rather than upon the inner surface of the chamber.—J. S. Zerbe.

Soapsuds Reduces Carbon Deposit in Compressor

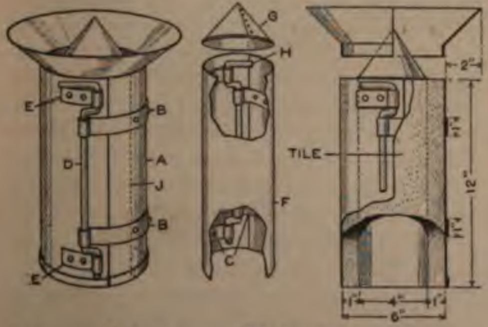
Trouble was experienced with an air compressor, due to the accumulation of carbon in the cylinders, and after several methods for removing it had been tried unsuccessfully the feeding of soapsuds into the cylinders from an oil cup was suggested. While it did not prevent completely the formation of the carbon, the compressor could be run much longer without cleaning, and when it was shut down the deposit was found to be soft and easily removed. The soapsuds were introduced into the cylinder for about one-half hour once a day, and the feed from the oil cups was increased at this time.—T. Burns, Elmira, N. Y.

A Homemade Concrete-Tile Machine

I built this tile machine for a farmer who made concrete drain tile in his spare time. The machine may be of various sizes, this one being for tile of 6-in. diameter, 1-in. wall, and 12 in. long. Heavy galvanized sheet iron, 12 by 26 in., was bent to a circular shape, and an internal diameter of 6 in., for the form A. The ends, at J, overlap 2 in. Make two straps, B, 1/8 by 1 by 8 in., and bend eyes for the rod D, of 3/8-in. iron. Make two 4-in. pieces, E, similarly, and rivet both sets to the form A, as shown. Bend the 3/8-in. iron rod D into shape and fasten it to the bands B and E. Make a hopper for the top, completing the outer form A.

Sheet metal, 14 by 12 in., is used for the inner form F, which is 4 in. in outside diameter. Rivet on, as shown, four straps of iron, C, provided with eyes, for the rod H. This rod is arranged so that, when the end H is set as shown, the outside diameter of the core is 4 in., and when released, becomes less. Make a cap, G, used only while filling the mold.

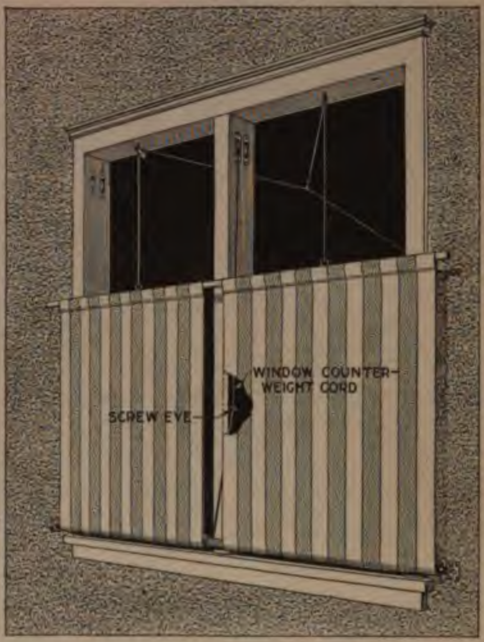
To use the machine, the form A is set on a suitable board, and the core F centered. The latter is then expanded, and the cap and hopper are put on. The concrete mixture is tamped in, the core is released by the handle H, and removed. The form A is taken off by releasing the rod D, leaving the tile on the board to cure.—R. S. Matzen, Fort Collins, Colo.



A Farmer Made Concrete Tile for His Land in Spare Time by Means of This Simple Machine

Weather Curtain for Converted Sleeping Room

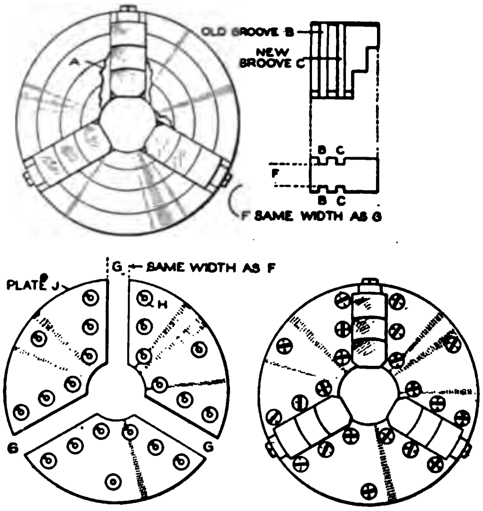
The arrangement shown in the sketch served to convert an ordinary bedchamber into an out-of-door sleeping porch. The windows were removed from their frames to give plenty of fresh air. An awning was necessary to protect the room from the weather and to screen it properly. The awning cloth, pulleys, cord, and bearings for the rod were obtained at an awning store. A curtain pole served to wind the canvas; brass hinge pins, slipped through standard awning sockets and made fast in the ends of the pole, provided excellent bearings for the pole to revolve upon. The problem was to find some means of rerolling the awning automatically and keeping it stretched taut in the wind. To do this, one of the counterweight cords in the window sash was extended, wound around the awning pole in a direction opposite to that of the canvas, and made fast. The awning proved effective and strong.—Jack Bechdolt, Seattle, Wash.



The Curtains are Held Taut and Rolled by the Center Cord Fixed to a Sash Weight

Repairing a Damaged Universal Chuck

A universal lathe chuck was broken, as at A in the illustration, two of the jaws being ineffective. It was thrown into the scrap heap, and I repaired it as follows: New grooves, C, were cut on the sides of the jaws of the same size as the old grooves B, the jaws being annealed. A plate of soft steel, to fit groove C, was made of the same diameter as the face of the chuck, and a center hole cut in it. It was drilled, tapped, and counterbored, as at H, at the left, and fastened with screws. Three slots, G, were milled in the plate to correspond with the old guides for the jaws, thus forming the plate J. The jaws were fitted in the grooves G, and the chuck gave good service.—Richard H. Jehlicka, Worcester, Mass.



New Grooves were Cut in the Jaws to Fit Plates Fixed to the Face

---

Making a Loose Wooden Thread Fit Tightly

A loose handle, which was threaded into a mop, was tightened by driving a row of nails around the worn threads so that the fit was snug. The handle could be removed easily, just as if the threads were their original size. Nails with small or rounded heads are best for this purpose.—**Charles L. DeCou, Los Angeles, Calif.**

The Manipulation of Gold Leaf

An old Pittsburgh sign painter told me how he used to sit on the bows of the river boats and gild the figureheads, with much of his gold leaf blowing away. Finally he thought out this method: After removing the first leaf of gold, and thus exposing the next one, he turned over the paper leaf separating the gold, exposing as much of the gold leaf as he required for use, and, running his forefinger nail along the creased paper, cut the gold, after which he lifted it up on the tip. This is the method used generally today by sign painters, and many others who use gold leaf.

In gilding on glass, it is necessary to size the surface with water size, flowing plenty on until it runs off in quite a stream; onto this the expert swings his leaf, and it lands somewhere on the outlines of the lettering—he is not particular just how accurately, so that the letter is covered; and when he has all the letter spaces covered, with perhaps a great deal of space not included within the letters, he permits it to become dry. The leaf settles down flat on the glass.

There are several brands of gold leaf, grading according to amount of pure gold contained and the intended use. One variety is made expressly for gilding on glass, another for gilding on wood. The difference is mainly in the degree of thinness. One layer of leaf makes a good job on wood, while on glass two layers make a better job than one. For exterior gilding the medium shade of gold leaf does best; the pale-colored leaf contains silver, hence tarnishes from gas or smoke.

Water gilding is that in which the leaf is laid on a size composed of isinglass, or glue and water; oil gilding is done on a size composed of oxidized linseed oil. Water size is for gilding on glass, and oil size for gilding on wood. Oil size may also be used on certain textiles, and other surfaces, just as water sizes are sometimes used in decorative work. Water-size gilding is burnished as soon as the size and leaf are dry, by rubbing with a wad of raw cotton; the same with oil-size gilding. One book of gold leaf will gild 1½ sq. ft. of surface.

Varnish impairs the luster and color of gold leaf. If varnish must be applied, first coat it with pale shellac.

Gold leaf is injured by dampness and cold. If gilded work is varnished before it is perfectly dry it will show scratches. To avoid this, apply a thin coat of white shellac, which will soon dry, and upon this the coat of varnish may be laid. To remove gold leaf from any part where not desired, as in letter gilding, or lining, use a dampened chamois skin.

In oil-size gilding, if the size is too fresh it will drown the gilding or injure its luster. Better have the size too dry than too wet. If too dry, breathe upon it, which will give sufficient "tack" to the size to hold the leaf.

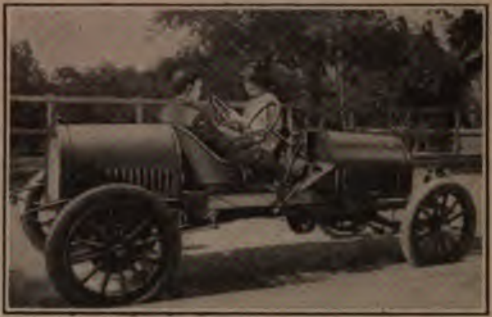
Where two pieces of leaf overlap they will often cause a joint to show, and this may be removed by gently stippling it with the tips of a bristle brush. To prevent laps showing on very smooth surfaces, have the size quite tacky. When gilding becomes dull from gases and smoke, its color may be restored by a weak solution of sulphuric acid.

To gild carved wooden letters, dip them into a thin priming paint, made from white lead and raw linseed oil, with a little drying japan. Then hang them up to dry. When dry, sandpaper smooth, using steel wool for getting into the curves. Next apply a coat of paint thinned out with turpentine and containing a little varnish. When dry, sandpaper lightly to smooth the surfaces and apply another coat of flat paint. When this is dry, apply a coat of shellac, to insure a perfect surface. Use a slow oil size. Then gild, when of the right "tack."

To prevent gold leaf from adhering where not wanted, as when letters of gold are to be made on a painted, or other, surface, a raw potato cut in two, and rubbed over the parts that are to resist the leaf, may be used.—A. Ashmun Kelly, Malvern, Pa.

A Double-Hood Roadster Automobile

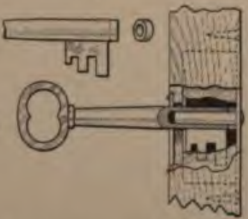
A novel automobile which proved very convenient in "trouble shooting" at a garage, and which was also used for local advertising purposes, was made by rebuilding a car to have two hoods, seats, and steering columns, as shown in the photograph reproduced. The extra fittings were bought at small cost, and this arrangement provided for the gasoline tank under the rear hood and gave plenty of space for tools, etc. The entire body was painted and striped in orange and black. In towing disabled cars one man faces the car being towed, and can readily inform the driver, if need be.—A. P. Swaidmark, Concord, N. H.



This Car was Dubbed "Automobile Janus" by Reason of Its Two "Faces"

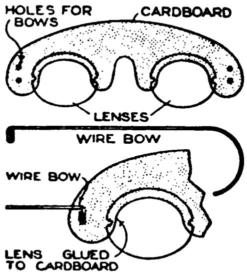
Adjusting Drawer Key to Insure Privacy

Where the locks in a cupboard or similar place are alike, and it is desired to make one of them private, a simple and efficient device is to saw off a piece of the key, about $\frac{1}{16}$ in. long. Force this washerlike ring down tight over the post of the lock in the keyhole, as shown. This key will unlock the lock, but when another is tried it will not go far enough into the lock to turn.—Oliver Higgins, Napoleon, Ohio.



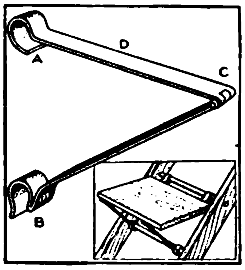
Improvised Frame for Broken Eyeglasses

In an emergency, when a pair of glasses was broken, and it was found difficult to get along without them, a pair of old lenses, broken at the fastenings only, was fitted into a frame made of cardboard. The frame was made of the proper size so that the lenses were centered over the eyes, and the lenses were glued to it. Bows were made of wire and fastened in holes at the ends of the cardboard. This improvised frame gave reasonable satisfaction, in spite of its peculiar appearance.—A. B. Wegener, Madison, N. J.



Folding Bracket for a Ladder

Pails, brushes, or other tools and materials used in working from a ladder, may be supported conveniently on folding brackets like those shown in the sketch. They are hooked to adjoining rungs and a board is fastened across them. When not in use they are folded out of the way, or removed from the ladder. They are made by forming a hinge joint in two strips of iron, as at C. The upper end A and the lower end B are curved to fit the rung without slipping off easily. The upper strip D is drilled to provide a fastening for the shelf.—James E. Noble, Portsmouth, Canada.



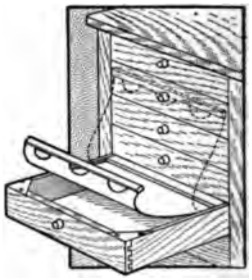
ℭA washer placed around the neck of a bottle containing poison marks it effectively.

Small Cutters or Dies Kept on Safety Pins

In the tool-dressing department of a machine shop there are usually many small parts, such as dies and cutters, to be ground. In order to keep the sets together, it was found convenient to place them on large safety pins made of spring-brass wire.—J. R. Minter, Washington, Ind.

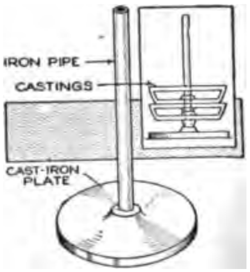
Protective Flap for Drawers of Drawing-File Cabinet

Drawings, tracings, etc., are wrinkled when the drawers of the file cabinet become so filled that the contents catch on the bottom of the next drawer above. The sketch shows how to avoid this by attaching a flap of flexible cardboard, or canvas, as indicated. Bind the front edge with a ½ by ¾-in. strip and provide handholes along it. Metal corner plates prevent the flap corners from lifting when they are tucked in. When selecting a drawing from the drawer, hang the flap on the knob of an upper drawer.



Stand for Stacking Irregular Castings

A stand which prevents breakage of irregular-shaped castings and economizes space is shown in the sketch. It may be made of a size suitable to the castings to be stacked upon it. The base is a plate of cast iron and into it is threaded an iron pipe. A number of pipes may also be arranged on one base.—E. A. Binney, St. Louis, Mo.



Formula for Calculating Automobile Speeds

It is often desired to calculate the speed of an automobile, the engine speed, gear ratio, etc., being known. The formulas ordinarily used are long and involved, with considerable possibility of error. The following formula will make the calculation easier. The abbreviations used are: S, speed of car in miles per hour; s, speed of motor, in revolutions per minute; R, gear ratio; T, diameter of tires on rear wheels, in inches; K, a constant, 336, by which the process is shortened.

Tracing the power from the engine through a known gear ratio, R, the speed of the rear axle will be R×s revolutions per minute. Each wheel has a circumference of 3.14 multiplied by the diameter, or 3.14×T in., which is 3.14×T÷12, if reduced to feet.

The car will be propelled a distance equal to the circumference of the wheels, with each revolution of the rear axle. Thus, to find the distance in feet traveled in a minute, multiply the speed of the rear axle—R×s revolutions per minute—by the circumference of the wheels—3.14×T÷12. To change this rate to miles per hour, before dividing by 12, multiply the result by 60, and also multiply the 12 by 5,280. Reducing this result, it is found that the process may be simplified so that T multiplied by R, multiplied by s, and the result divided by 336, gives the speed in miles per hour. Thus 336 is established as the constant K, for use in shortening the calculation. The formulas, carried through the above process are:

$$S = \frac{60 \times 3.14 \times T \times R \times s}{12 \times 5{,}280} = \frac{T \times R \times s}{336},$$

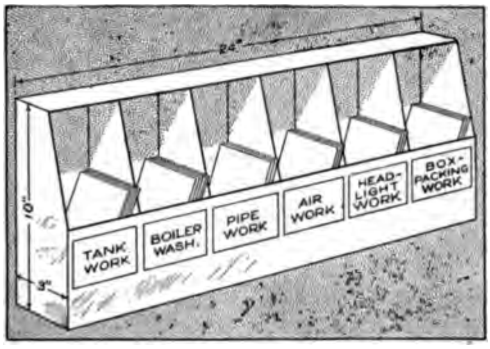
$$\text{or} = \frac{T \times R \times s}{K},$$

as outlined in the detailed process above. — Claude Schuder, Takoma Park, D. C.

¶A bundle of short strings, or cords, bound together can be used as a brush or swab.

Shop-Order Box Saves Time of Workmen

To facilitate the work in a large railroad roundhouse, the jobs for the various workmen were assigned by means of a card system. By placing the cards in an order box, subdivided for the various kinds of work, much time was saved, since the workmen removed the cards from their department files when passing the box, which was situated in a convenient place.

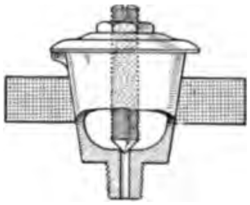


The Workmen Take Their Orders from the Box Instead of Having the Foreman Deliver the Cards to Them

---

Oil Cups Remodeled to Adjustable Feed

A number of plain oil cups were changed to a satisfactory self-feeding type at little expense as follows: The hinged cap of the oil cup was tapped for a 5/16-in. cone-pointed setscrew, and a locknut applied to prevent the screw from jarring loose. This screw acted as a needle valve, seating on the edge of the small hole in the bottom. A hole for filling the cup was drilled through the cover, and the latter was then sweated fast. A feed as slow as one drop in ten minutes was obtained, and when once set for its particular purpose, the valve needed no further attention.—D. A. Hampson, Middletown, N. Y.



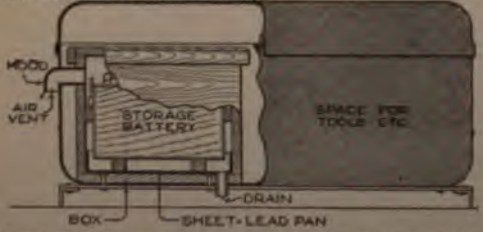
Illuminated Flag Remains Unfurled

On days when there is only a slight wind blowing it is difficult to make a large flag remain unfurled unless it is supported. The device shown in the illustration, which is a permanent fixture of the staff, combines this feature with the illumination of the flag. A frame made of a piece of pipe, curved to cause the flag to have the appearance of being blown in a breeze, is supported at the top from the flagstaff. A vertical section is fixed to this and attached to the staff at its lower end by a short piece of pipe. The flag is suspended from the pipe by rings. Shaded lights are arranged along the staff to move with the flag in a change of wind.—L. E. Crane, Hastings, Minn.

The Flag Remains Unfurled Even in a Light Breeze and is Illuminated at Night

Carrying Storage Battery in Tool Box

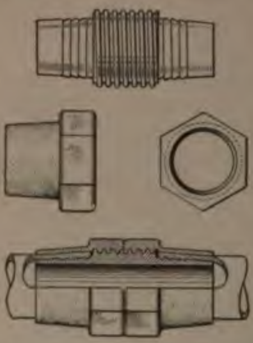
Motorists are often cautioned against carrying a storage battery in a tool box because of its injurious effect on tools, clothes, etc. Sometimes the tool box is most convenient for housing the starting and lighting battery, and this problem was solved as shown in the illustration. A wooden box was made, to hold the battery, having a tight-fitting cover, and painted inside with asphaltum acid-resisting paint. A sheet-lead pan was made to fit the bottom of the box, and provided with a drain pipe of lead, discharging to the ground. A lead-pipe vent passed through the side of the steel case to allow the gases to escape. The wires passed out through rubber packings in the front of the battery box.—Victor W. Pagé, Bristol, Conn.



Space was Economized by Incasing the Battery in the Tool Box, without Injury to the Tools

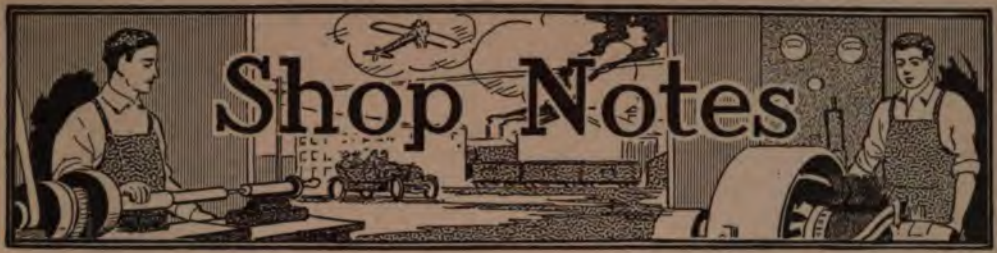
Positive-Grip Hose Coupling

In order to splice, or mend, various kinds of rubber, or fabric, hose I made the coupling shown in the illustration. The central section is a brass union having corrugations at the end and a threaded portion at the middle. The ends of the hose to be joined are held in place by two caps having a hexagonal nut at one end, the latter threaded to fit the center portion of the union. The caps are slipped over the ends of the hose, which are fitted snugly on the corrugation. By drawing up the cap, a close joint is secured. —E. E. Burnham, Amite City, La.



Electric Drier Used in Drafting Room

A portable combination heater and fan, such as is ordinarily used by barbers, was employed successfully for the drying of ink on tracings and drawings, and for drying prints and mounted sheets in a drafting room. This kink saved considerable time in inking drawings, as it was not necessary to wait long for the ink to dry.



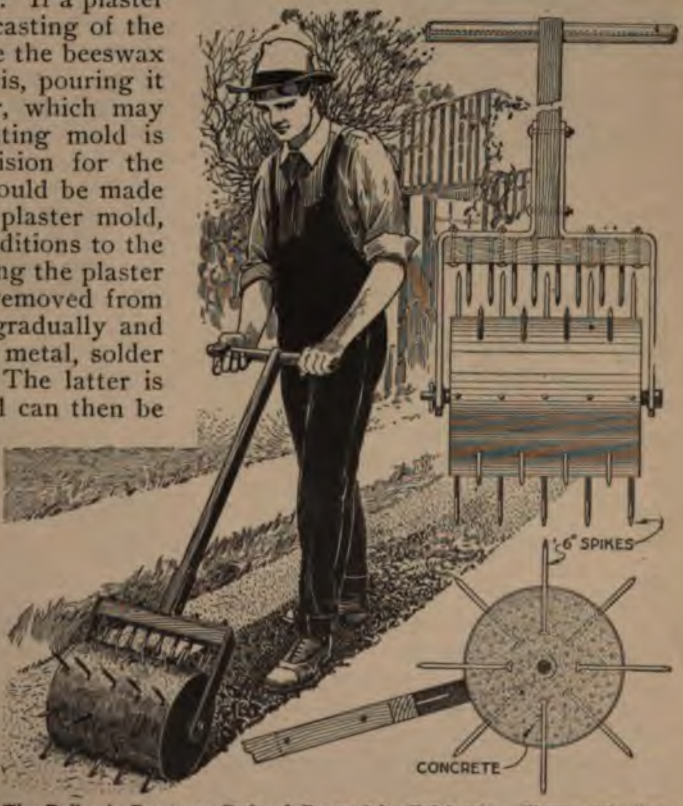
Wax Patterns for Making Plaster Molds

In experimental work, as well as in the making of patterns for ornamental or shaped pieces, the use of wax patterns is economical and practical. Pour the melted beeswax into a rough mold, or box, approximately the size of the pattern. Cool it, and carve it to the desired form, using a knife, or other sharp tool, slightly warm. If a plaster mold is desired for the casting of the pattern in metal, immerse the beeswax pattern in plaster of Paris, pouring it into a suitable container, which may be used when the resulting mold is poured in metal. Provision for the entrance of the metal should be made by cutting gates in the plaster mold, or by making suitable additions to the wax pattern before pouring the plaster around it. The wax is removed from the mold by heating it gradually and then pouring the molten metal, solder or lead, into the mold. The latter is sawed open carefully and can then be used again. The soft metal may be shaped further to form a pattern for molding in sand, if desired.

Spiked-Roller Garden Harrow

Proper cultivation of perennials in the home garden, beds of which cannot be spaded handily without injury to the plants, was provided by the use of a homemade roller harrow. In the spring, when the asparagus, for example, comes up, the bed is harrowed thoroughly, stirring up the soil, and pulverizing it, without cutting the roots. The piercing of the plants by the spikes does no serious harm. The frame supporting the harrow may be fitted to a plain roller when desired.

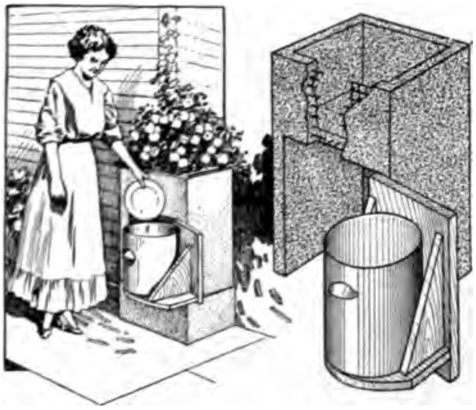
The roller harrow was made as follows: A large can was fitted with 6-in. spikes, spaced as shown in the detail sketch. A pipe was set in the center of the can, which was then filled with concrete. A rakelike cleaning bar, made of 2 by 2-in. stock, and fitted with spikes, spaced to mesh with those



The Roller is Run over Beds of Perennials, Cultivating Them with Only Slight Injury to the Roots, Which does Not Hinder Growth on the roller, was fixed to the handle and the strap-iron braces. The latter were set on a long bolt, inserted in the center pipe, and provided with a cotter for easy removal.—E. B. Smith, Chicago, Ill.

Garbage-Can Housing of Reinforced Concrete

The unsightliness, and most of the common insanitary features, of the home garbage can were overcome by providing a concrete receptacle for it. The upper part was arranged as a flower box. A large lard can was used as the garbage container, its comparatively small size making it necessary to empty it frequently. The can is set on a shelf, bracketed to the door, which is hinged on a wooden strip, set into the concrete. A metal latch holds the door shut.



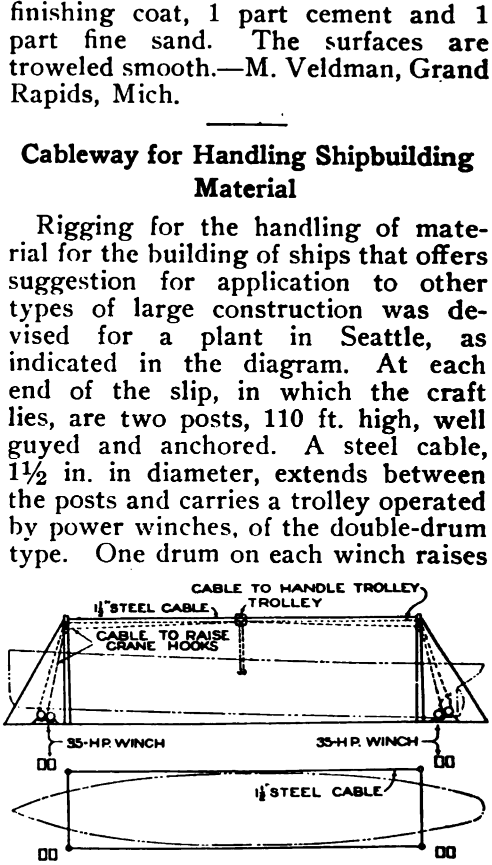
The Garbage Can is Concealed in a Container Which Serves Also as a Flower Box

The size of the housing is suited to the can. That shown is 36 in. high. The hollow base is cast separately, without reinforcement. The form for the base consists of one box within another, the intervening space being filled with concrete, the concrete for the top of the base being placed over the top of the inner box, and leveled off on the upper edges of the outer form.

The main section of the housing is built up around a wire-mesh frame. The mesh is cut to form reinforcement for the three longer vertical sides, and bent into shape. The smaller piece for the front is wired into place. The mesh for the bottom of the flower box is also wired securely. The concrete is applied to the sides of the mesh, a roughing coat being first applied. The surface of this is left rough to afford a good hold for the finishing coat. For the roughing coat a mixture of 1 part Portland cement and 2 parts of clean, fairly fine sand is used; and for the finishing coat, 1 part cement and 1 part fine sand. The surfaces are troweled smooth.—M. Veldman, Grand Rapids, Mich.

Cableway for Handling Shipbuilding Material

Rigging for the handling of material for the building of ships that offers suggestion for application to other types of large construction was devised for a plant in Seattle, as indicated in the diagram. At each end of the slip, in which the craft lies, are two posts, 110 ft. high, well guyed and anchored. A steel cable, 1½ in. in diameter, extends between the posts and carries a trolley operated by power winches, of the double-drum type. One drum on each winch raises and lowers the crane hook on the trolley and the other pulls the trolley back and forth.—B. W. Brintnall, Seattle, Washington.



The Cable Suspended from the 110-Foot Posts Carries a Trolley for Handling Material

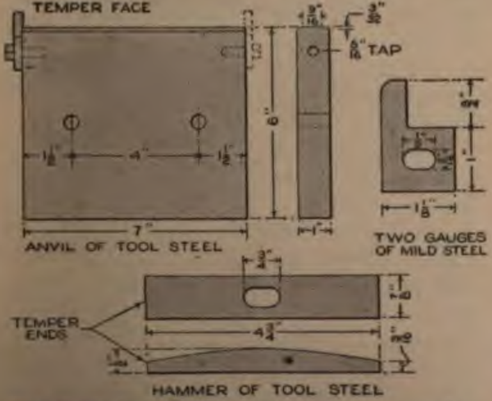
**¶A coat of raw linseed oil brigh
and preserves ol
not permit it t
lower edge
edges.**

Two Shovels Used as Post-Hole Auger

When only a few holes for posts are to be made, and no auger is at hand, a good substitute may be devised by using two spades, or shovels. A strong rope is tied around the handles of the shovels to form a loop, about 8 in. long when extended. Grasp the shovels by the handles, extend them within the rope, and drive them into the ground. The earth is cut loose, and then removed from the hole by spreading the handles, and drawing it up between the shovels.

Saw-Setting Anvil and Hammer

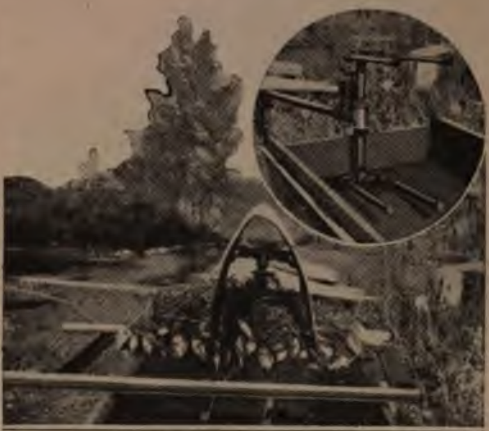
A set of tools such as are often used by saw setters may be made readily by mechanics. A hammer and anvil with gauges are shown in the sketch. The hammer is tempered and provided with a hickory handle. The anvil is mounted in an oak, or maple, block, or post, to be set on a bench, or on the floor. The latter is preferable, as it makes a more solid base. The anvil is fitted into the block deeply, and pins are driven through the side holes. The anvil, not receiving the blow of the hammer directly, may be left hard. Mild-steel pieces are fixed on each end of the anvil, and adjusted for various sizes of saw teeth, which are set over the beveled edge of the anvil.—Donald A. Hampson, Middletown, N. Y.



This Outfit Is Practical for Individual Use, or for Saw Setting as a Business

A Rack for Washing Vegetables

A simple device for washing vegetables, and by the use of which a truck farmer was able to get better prices for his product, is shown in the illustration. It is made of gas pipe and connected to the irrigating system of the farm. A 2-in. pipe is connected to a smaller one and a cut-off is placed between them. A 1-in. pipe is connected to the cut-off and reduced to smaller connecting pipes on each branch. The water finally reaches four short lengths of pipe. On the upper side of the lower pipes and on the lower side of the two upper ones, small holes are drilled in a line. The small streams make two vertical sheets of water. The vegetables are placed on a screen, which is set on top of the trough. A cover of sheet iron is fitted over the pipes and the tray. It prevents the water from sprinkling on the person washing the vegetables.—M. Glen Kirkpatrick, Des Moines, Ia.



Better Prices were Procured for Vegetables Washed by the Use of This Arrangement

¶Local reductions of density in photographic negatives may be effected by rubbing with a bit of old handkerchief dampened with alcohol. The cloth "bites" best when nearly dry, and two folds should be used over the end of a match for working in small areas.

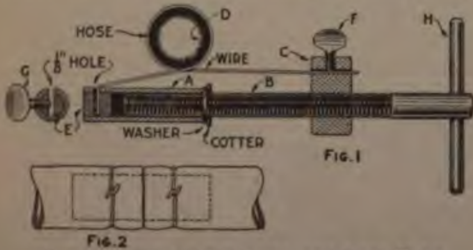
Garage Roof as a Playhouse

In building a garage in a small city lot, the roof was utilized to make up for the space taken from the play area of the children, by building a pergola on it, as shown in the photograph reproduced. A high coping was built around the edge of the wall and an outside stairway provided. The space is very popular as an open-air room for the whole family, a safe play place for the children, and a cool recreational spot for informal little parties. Porch furniture was fitted to the playhouse and increased its usefulness.—Lee McCrea, Claremont, Calif.

The Roof of the Garage was Fitted Out as a Useful Play Area and Recreation Spot

Device for Repairing Water Hose

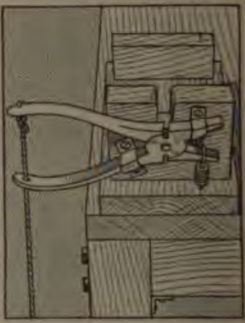
If breaks in rubber or fabric hose are repaired promptly, the life of the hose can be extended considerably. By the use of the device shown in the sketch, repairs of this kind may be made quickly and substantially. A short nipple is placed in the ends of the hose, as shown in Fig. 2, and binding wires fixed around them, by the method shown in Fig. 1. The wire tightener is made as follows: A short piece of 1/2-in. iron pipe, A, is fitted with a threaded bolt, B, which slides in it. A cotter is set through the bolt, and engages a washer at the end of the pipe A. A metal block, C, is tapped to fit the bolt B, and a hole is drilled in it for the wire, which is clamped by means of the thumbscrew F. The end of the pipe A is plugged, as shown at E, and a 1/8-in. hole drilled for the wire, clamped by the screw G. When the wire is in position around the hose D, the handle H is turned, and the wire drawn up tightly. The device is then twisted so that the wire is held securely around the hose and the nipple.—W. Drynan, Kansas City, Mo.



Draw the Wire Up Closely, and Lock It by Twisting the Device

Foot-Lever Wire Cutter Made of a Plier

In cutting a large quantity of wire in short lengths, when only a hand cutting plier was available, considerable time was saved by rigging the plier with a foot lever and a gauge, as shown. The plier was mounted on a slotted block by means of two straps of sheet iron, and a spring was fixed to the lower jaw, and to the base block of the device. A hole was drilled into the lower handle and a cord from the foot lever was passed through it and fixed to the upper handle. The wire was passed through the slot, its end against the gauge block, and cut off by a light stroke on the foot lever.—James P. Lewis, Golden, Colo.



¶A large leather or rubber washer on the handle of a brush, used overhead, prevents the liquid being applied from dripping on the hand.

A Homemade Refrigerator At Small Cost

by Charles A. King

AIR-PROOF walls, free circulation of cool, dry air, the purity of the ice, and the cleanliness of the ice chamber, are essential factors in the efficiency of a refrigerator. That described in this article, and detailed in the illustrations, was designed with these factors considered, and makes ample provision for the needs of a large family. It was built at a cost of $17.50. If it is kept well iced, the circulation of the air, which is fundamental, will be maintained by the rising of the warmer, and the falling of the colder, air. The interior is of spruce—whitewood or poplar are good—having no odor to affect milk or butter.

The stock bill, lumber listed in lineal feet unless otherwise specified, is as follows:

95 board ft. matched spruce; insides; ⅞ in., 10 and 16 ft. lengths.
85 board ft. matched pine; outsides; ⅞ in., 10 and 16 ft. lengths.
100 ft. strapping; furrings; ⅞ by 2 in.
18 ft. spruce; linings and furrings, corners of front; ⅞ by 2 in.
14 ft. spruce; linings and furrings, header and base of front; ⅞ by 4 in.
4 ft. spruce; linings and furrings under ice door of front; ⅞ by 5 in.
9 ft. spruce; linings and furrings for mullion; ⅞ by 2½ in.
9 ft. pine; corners of front; ⅞ by 3 in.
4 ft. pine; mullion; ⅞ by 2⅝ in.
7 ft. pine; header and base; ⅞ by 4 in.
4 ft. pine; under ice door; ⅞ by 5 in.
3 ft. pine; legs; 1¾ by 5¾ in.
3 ft. pine; legs; 1¾ by 3¾ in.
12 ft. pine; cap; ½ by 3 in.
12 ft. pine; base; ½ by 4 in.
30 ft. spruce; door jambs, milled; 1¼ by 2⅝ in.
30 ft. spruce; door frames, milled; 1¾ by 2½ in.
50 ft. whitewood; shelves; ½ by 1½ in.
140 sq. ft. building paper.
1 sheet galvanized iron, No. 26 gauge; 28 by 96 in.
1 sheet galvanized iron, No. 26 gauge; 21 by 40 in.
1 lb. solder.
1 piece lead pipe, light weight; for waste pipe.
2 lb. sixpenny common nails.
1 lb. 2-in. tinned clinch nails.
2 lb. eightpenny common nails.
1 lb. sixpenny finish nails.
1 lb. eightpenny finish nails.
3 pair galvanized-iron hinges, 4 in.
3 lever door fasteners; galvanized, 4 in.
8 screws; 3½ in., No. 15; to fasten legs.
1 pt. shellac.
1 qt. paint.

First make horizontal frames C and D for the top and bottom, of 2-in. strapping, as shown in Figs. 1 and 3. Square them carefully to give a good support for the structure. Tack building paper for insulation on the inner side, and nail spruce lining boards over it. From the stock for the outside, cut pieces for the outer sides of the top and bottom, to project about 3 in. around the edges of the frames, as indicated at E, Fig. 3. Tack building paper upon the open side of each frame, and nail on a part of the boarding, leaving an opening for packing in the filling. The latter may be dry shavings, sawdust, mineral wool, paper, or other nonconducting material. When the filling is in place, nail on the rest of the boards. Bore a hole for the waste pipe F, centered 1½ in. from the end

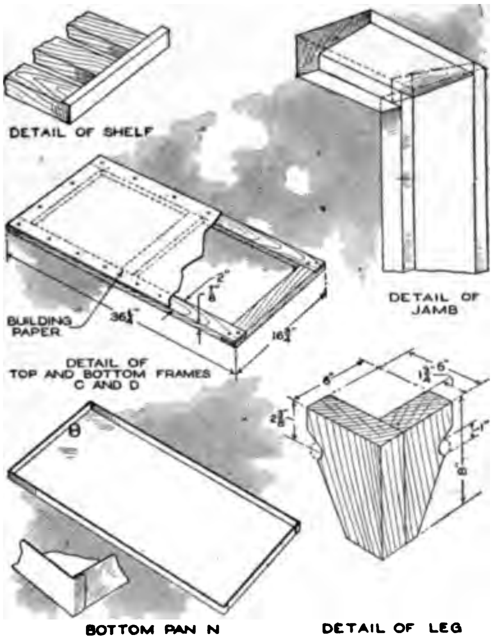


Fig. 1
Details of Several Constructional Features and Fittings

and 4¼ in. from the back edges of the lower frame.

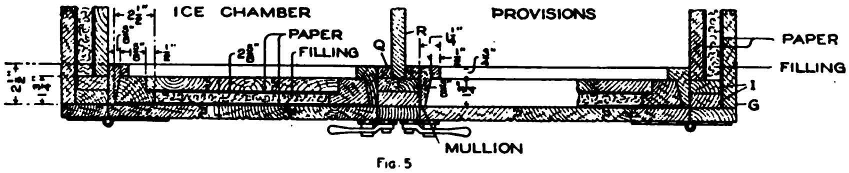
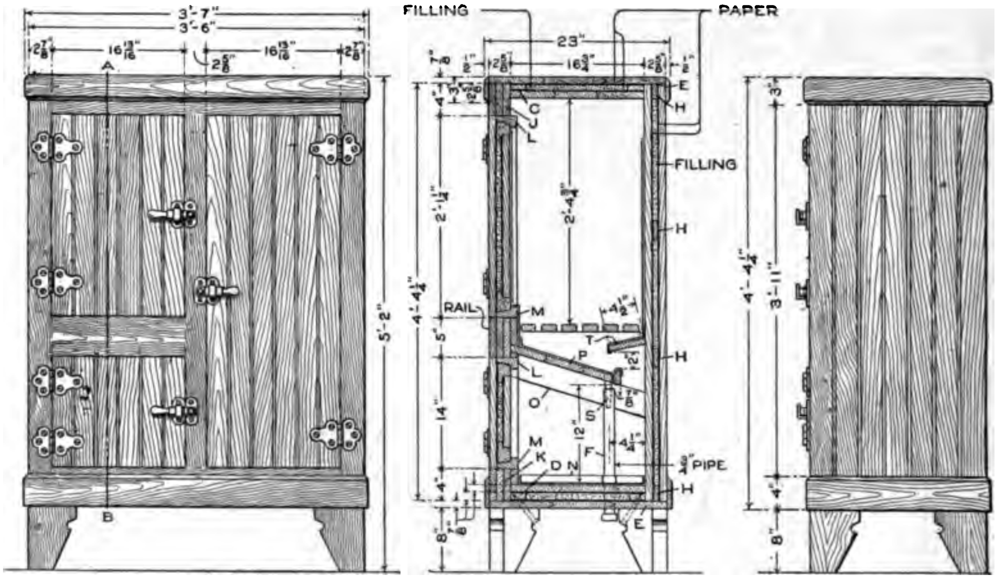


Fig. 5



FRONT VIEW
Fig. 2

SECTION A-B
Fig. 3

END VIEW
Fig. 4

The Working Out of the Parts and Their Assembling Involve Processes Which Are Comparatively Simple, If the Work is Done Systematically as Described

Cut spruce lining, 4 ft. 4¼ in. long, to make a width of 6 ft., to cover the two ends and the back. Remove the grooved edge of one piece and joint it straight; nail it as the first piece of the lining at the front right corner G, Fig. 5. Set the top and bottom frames on end, and nail the lining on with eightpenny common nails. Make certain that the jointed edge is square with the inside surface of each frame. After the lining is in place, cover it with sheathing paper. Nail on the furrings H, clinching the nails in the middle ones on the outside.

Make the corner strips I, Fig. 5, the width shown. The linings J, above, and K, below the doors, are fitted as shown in Fig. 3. The mullion is built up, as detailed in Fig. 5, and the rail between the upper and lower compartments, as detailed in Fig. 3. Care must be taken that the door openings are square.

Cover the furrings of the ends with sheathing paper, and pack the spaces with insulation. Fit and nail the headers L, and thresholds M, of the door jambs, matching the corners as detailed in Fig. 1. The bottom pan N, as shown in Fig. 1, should be ⅜ in. narrower and shorter than the bottom of the inside of the refrigerator. Nail the pan around the top edge with tinned nails. Set the waste pipe F through the bushing of the pan and the hole in the bottom, in nailing the edges of the pan.

The interior of the refrigerator is fitted next. Nail in cleats O, Fig. 3, supporting the ice floor P, of spruce, and cleats similar to those at Q, F 5, on the back, to receive the fenc The latter is of spruce, fitted hor tally, and extends 6 in. from the top of the interior. A ¾-in. hole is bored in the ice floor to receive the thimble S, fitted into the top of the waste pipe.

The measurements of the metal protection for the ice chamber are next taken. Every part that comes in contact with the ice should be covered. The iron lining on the inside of the door fits between the jambs when the door is closed. After the ice pan, on the floor P, is fitted, the hood T is nailed in, and its iron covering fitted. A trap is fitted on the lower end of the waste pipe F, to prevent the escape of cold air. The making of the metal interior should be left to a tinsmith, unless one is experienced in this work.

The trim on the front is built up in one piece, and fitted into place after the interior is complete. The door frames are fitted to allow for swelling, $\frac{1}{16}$ in. on all sides. The doors should be fitted tightly against the rabbet of the jamb, and should not bind on the sides. The fronts of the doors are put on with screws from the back of the rabbets of the door frames. Line and fill the doors as shown in Fig. 5. The cap and the base moldings are mitered and nailed on. The legs, detailed in Fig. 1, are fastened with screws. The trimmings may be of galvanized iron, brass, or bronze. The shelves, detailed in Fig. 1, are made of slats and are bound with iron. Parts of the lining not covered with iron are shellacked two coats, and the outside is suitably finished.

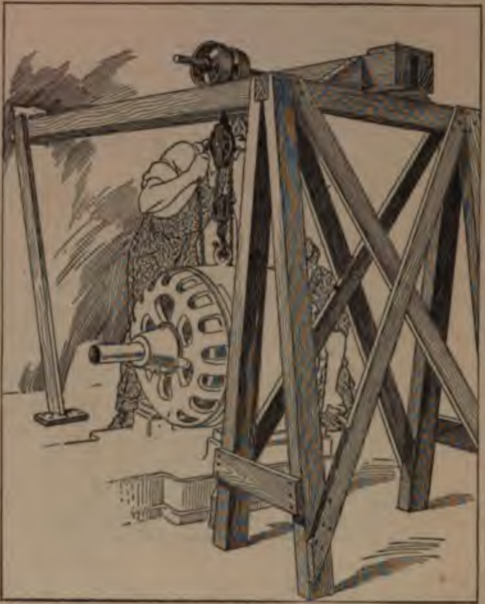
Leather Pattern Fillets Set in Shellac

Thick orange shellac should be used in setting leather fillets in patterns, in preference to glue, as the moisture from the wet sand tends to loosen the leather. Both the fillet and the corner are shellacked with several coats before applying the fillet, which is rubbed in with a round stick of suitable size.

¶In painting or finishing wooden rods, small patterns, etc., it is convenient to hold them by brads driven in the ends.

Improvised Rigging for Lifting Heavy Machine

In an engine room where there was no crane it was found necessary to remove the armature of a 75-kw. alternator and the upper part of its frame. The roof timbers could not be depended upon, and a tripod derrick would lift but not swing aside the armature.

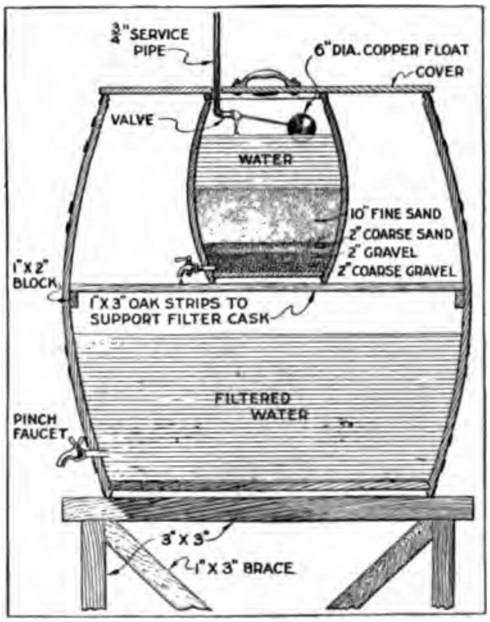


This Support for Differential Tackle was Devised in an Emergency for Taking Down a Generator

An improvised crane was erected by using two 4 by 8-in. timbers, rigged as shown. One end of the joined timbers was inserted into an adjacent wall, and fastened with a slanting brace. The other end was supported on a strongly braced horse. Two 10-in. diameter pulleys were mounted on a steel bar, the outer ends of which were secured by cotters. A chain was run over the bar to form a short loop, to which the differential block was hooked. The frame was unbolted and the upper part raised 1 ft., and rolled beyond the base, where it was set down. The armature was next lifted and shifted to a truck.—H. S. Rich, Poughkeepsie, N. Y.

A Barrel Water Filter

A filter, which was constructed for use in a summer camp, and which can be used in various sizes for other situations, is shown in the illustration in a vertical sectional view. A cask of about 15-gal. capacity was used as the filter tank, and partly filled with gravel and sand, as indicated. The service pipe was fitted with a check valve operated by a copper float and lever arm. The cask is supported in the larger barrel or reservoir by two oak strips, the water from the filter flowing down into the reservoir, and being drawn from it at the pinch faucet.



The Water is Filtered through the Layers of Sand and Gravel, and Stored in the Reservoir

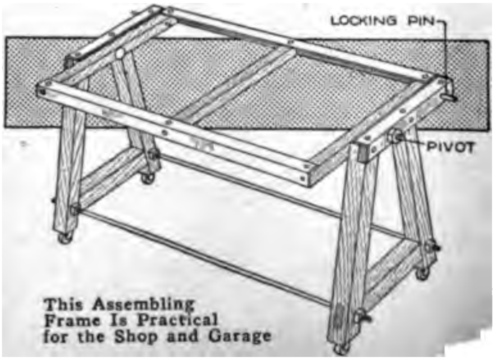
The cover of the reservoir is made in two parts, so that it may be removed from around the service pipe. Where water is not available through a pipe line, it can be poured into the filter from pails. The supporting frame is of oak, strongly braced. The reservoir should be painted inside with tar, such as is used in damp-proofing. The sand, particularly the upper portion, should be replaced from time to time.—John E. Cahill, Jr., New York, N. Y.

Painting Iron to Withstand Wear

Iron should be painted immediately after being cast or fabricated, if the best results in protection by the paint are desired. The paint should be applied in a dry wind or the warm sun, rather than on a damp day or at times of the day when the air is damp. The surfaces to be painted should be free from rust. A first coat of red lead and linseed oil is applied and permitted to dry hard. Two or three additional coats of red or white lead are then applied. If the iron is old, the paint should be burned off, rust and scales removed, and a coating of turpentine applied. Then the process is the same as with new iron.

Frame for Assembling or Examining Automobile Engine

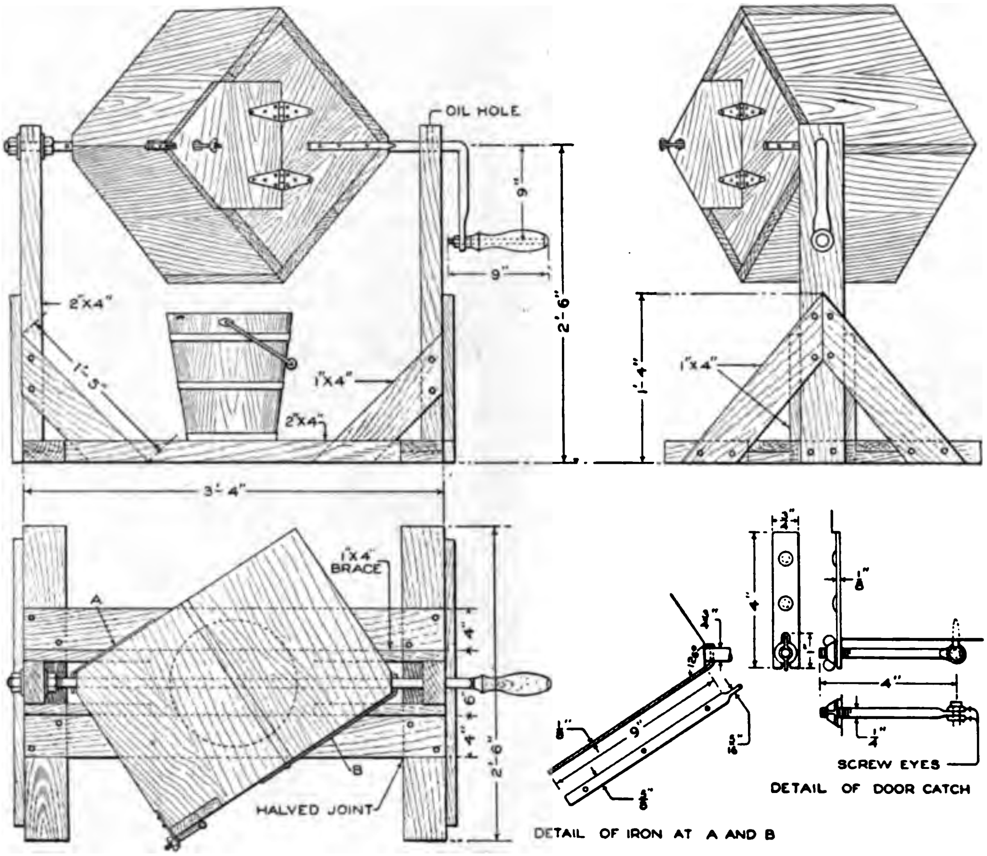
An automobile engine is hard to handle when being assembled, repaired, or tested, unless a device is provided by which it can be reached at any part. The frame shown in the illustration is useful for the garage or shop, and is made of heavy wood, braced with iron rods and protected at the points of wear with angle iron. The engine is mounted on the frame, which is pivoted at its ends. A locking pin at each end steadies the frame. When it is desired to get at another part of the engine the frame may be turned and locked at the desired position. Casters make it venient to move the [illegible] from to place.—R. [illegible]
District of [illegible]



This Assembling Frame Is Practical for the Shop and Garage

A Revolving Feed Mixer

The mixing of feed for poultry, stock, and other animals can be done quickly and thoroughly by means of the homemade mixer shown in the detailed drawings. It consists essentially of a box of ⅞-in. lumber, inclosing a chamber in the form of an 18-in. cube, mounted diagonally on a shaft, and supported by a wooden stand. The detail dimensions may be varied, but the main sizes indicated are such that the device can be handled conveniently. The feed is inserted at the hinged door, and the shaft is turned by means of the crank. The supporting stand is of 2 by 4-in. stuff, strongly [illegible] ry the shaft. [illegible] for the [illegible] tail sketches. The iron strips at A and B are formed into a pin at one end, and this is bent and set in the shaft, holding the chamber in place. The door catch is a bolt hinged between two screw eyes, and provided with a wing nut, by means of which the door is clamped at the notched strip of iron at the corner. In any case, the device should be set high enough so that a bucket or feed box may be set under the mixing chamber.—Gus Hansen, Peachland, Canada.

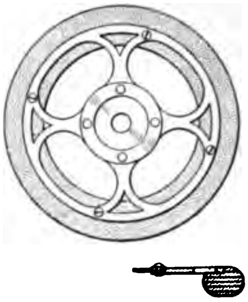


The Front and Side Elevations, Above, and the Plan, Below, Show the General Structure; the Metal Fixtures are Detailed in the Smaller Sketches

---

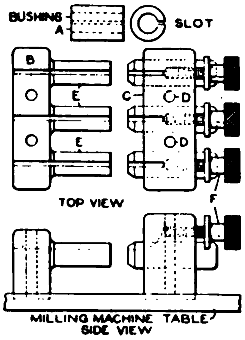
Drain tile and similar products are awkward to carry, and a convenient method of handling them with slight breakage is by the use of an iron bar, bent U-shape to form a handle. One end of the bar is inserted in the tile and the other serves as a grip.

Boat's Wheel Made from Bicycle Sprocket



By mounting an old bicycle sprocket wheel on a wooden ring, cut from a board glued up of several layers, as shown in the sketch, I made a steering wheel for a motor-driven canoe which gave complete satisfaction. The veneered stock was obtained from an old tea-shipping case and was built up to a thickness of 1 in. The wheel is 9 in. in diameter, and the wooden part was varnished, rubbed down with steel wool, and given a high polish. A piece of ¾-in. pipe was used as the shaft, and the wheel was locked to it with locknuts. —B. E. Dobrée, Battleford, Canada.

Jig for Slotting Bushings on Milling Machine

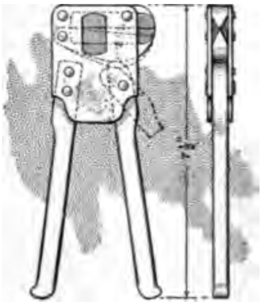


The slotting of three bushings, A, at once, on the milling machine is accomplished by the use of this jig. Part B is bolted to the milling-machine table; part C is also bolted down, at the holes D, but must be loosened and moved back when the work is changed. The bushings are held on the pins E, which are a trifle shorter than the bushings. The bushings should fit snugly on these pins. The adjusting screws F are used to tighten the bushings and take up any slight variation in length. The stop should be set to prevent the saw from going through member C.—C. Ander-
Worcester, Mass.

Garden-Hose Rollers for Graining Woodwork

Short sections of rubber-surface garden hose can be made into satisfactory rollers for use in graining woodwork by cutting rings around the hose carefully, in imitation of the grain of the wood. The hose may be mounted on a wooden roller and fitted with a handle. Used in this way, it is best to make the wood grain fairly straight. The hose may also be cut to give several strips on the surface, extending its length, each strip being notched to produce a grain effect in varying sizes, when drawn over the woodwork.

Cutting Pliers for Tool Room



A powerful cutter for cutting screws to length without injuring the thread was made in a tool room, as shown in the sketch. The side plates are of wrought iron and the handles and cutters are of tool steel, tempered. Machine screws may be used instead of rivets, and the cutters removed easily for sharpening. The outside cutting edge is not essential but gives the tool a wider range of use.

Preventing Rapid Rusting of Auto Fenders

It is not uncommon to observe automobile fenders through which holes have rusted and which are loose at the fastenings. To prevent this and to give the fenders longer life, wash the mud and dirt from under them frequently. A rust preventive, or any suitable oil, will aid as a preservative, but the mo
important precaution is to prevent accumulation of mud, under whic
rust soon forms.—C. H. Thoma
nett Squ

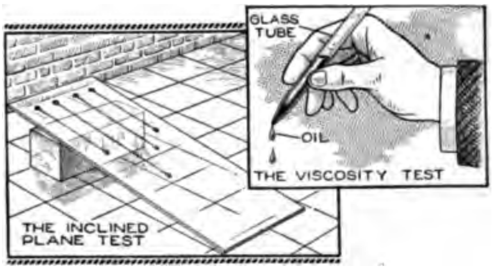
Testing Oils for Lubricating Qualities

The user of lubricating oils should have a knowledge of their merits and this can be gained readily by a series of simple tests, shown in the illustrations. One of the chief characteristics of lubricating oil is its tendency of gumming into a resin by oxidation, rendering it unfit for lubrication purposes.

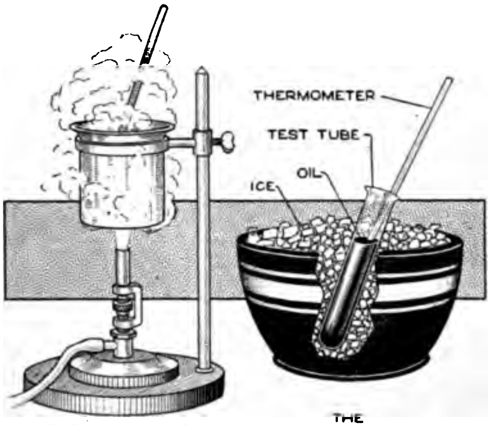
A simple test can be made by elevating a sheet of glass, 2 by 4 ft., 6 in. at one end, thus forming an inclined plane. A drop of oil from each sample under test is put at the top of the plane. The drops should be placed several inches apart so that they will not spread into each other. A notation is made of the progress of the oil as it flows down the plane, several days being necessary to complete the experiment. It is desirable to make a record of the flow every six hours. The oil flowing the farthest has the best body. The oil under test should be kept free from dust, under cover if possible.

To test the fluidity of oil, heat a piece of ⅝-in. glass tubing to a red heat, draw out one end to a diameter of 1/16 in., and cut it to a length of 4 in. Fill it with the oil and note the time required for all of it to drip out at the small end. Repeat this with each sample to learn the relative viscosity.

Oils for gas or oil engines should be selected for their ability to pass successfully the "fire test." A metal cup of ½-pt. capacity is filled with oil and heated to a high temperature. A ther- is held continuously in the oil so that the temperature at the "flash point" can be determined. As the temperature approaches a high value, pass a lighted taper back and forth across the top of the cup, ½ in. above the smoking oil. The moment the rising gas "flashes," then goes out, and "flashes" again, note the temperature immediately. This is called the "flash point." Continue to heat the oil until it bursts into flame, and continues in this state. Read the temperature again. This value is known as the "fire point." These two tests are especially valuable in selecting oil for high-speed tool work where the temperature is often high. These tests should be made only in a suitable shop, or a laboratory, and proper precautions against fire taken.



Ease of Flow Is an Important Factor in Determining the Lubricating Value of Oil



THE FLASH TEST THE FREEZING TEST

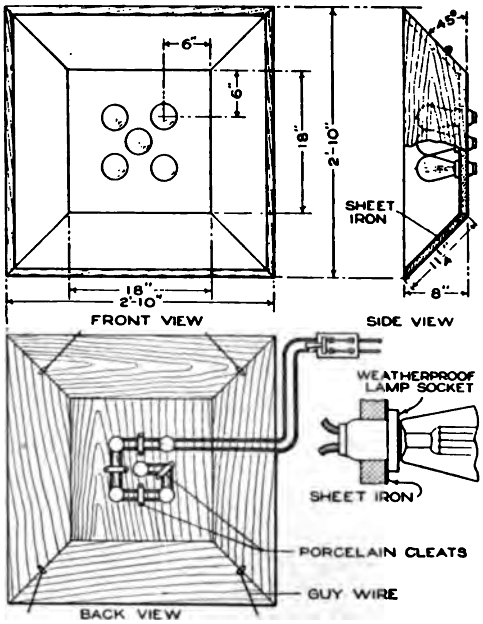
The Flash and the Freezing Tests Are Both Important in Grading Oils for Lubrication

To ascertain the freezing point of an oil, fill a test tube and place it in a vessel of crushed ice. If the oil, which should be continually stirred with a thermometer, does not solidify at this temperature, salt should be mixed with the crushed ice. The moment the oil solidifies, read the temperature, for the "freezing point."—K. M. Coggeshall, Webster Groves, Mo.

ℭWax applied to the bottom of cleats, supporting temporary walks over newly finished floors, will prevent the cleats from sticking.

Reflector for Flood Lighting Construction Work

On a large construction job much of the work was done at night. The problem of providing good illumination was finally met by the use of the flood-lighting reflector shown, because of the considerable cost of metal fixtures with glass, or porcelain, reflectors. The inside of the reflector was covered with thin sheet iron, and weatherproof lamp sockets were set in place, as shown. The wiring was done on the back. The inside surface was painted with two coats of white enamel and the outside with red lead. The reflectors were fitted with 100-watt nitrogen-filled lamps and suspended on wires, to project the light as desired, and guyed to prevent swinging. Before blasting, it was only necessary to unhook the suspension wires, placing the reflectors flat, planks protecting them from heavy fragments of rock. One of the reflectors was mounted on the boom of each derrick, making the skip, or bucket, plainly visible.—T. S. Burns, Elmira, N. Y.



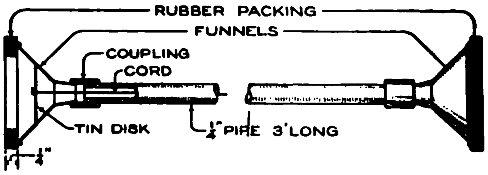
This Cheaply Constructed Reflector Proved Useful in Illuminating a Large Construction Job

Electric Pad Warms Auto Radiator in Garage

In order to prevent the freezing of the water in the radiator of an automobile, stored in an unheated garage, an electric heating pad was used. The pad was flexible, 12 by 15 in. in size, and was connected to the light socket. With the current turned on to "low," ample heat was provided to prevent freezing, at a cost of about six cents a day.—C. E. Drayer, Cleveland, Ohio.

Device Locates Pounding in Engine or Machinery

Better satisfaction is given by the homemade device shown in the sketch in locating "knocks" in engines and machinery than anything I have yet found. It was made as follows: Two small funnels of metal were fitted into the ends of a 3-ft. length of ¼-in. pipe, and a coupling was placed over the joints. Tin disks were soldered into the funnels, as shown, and a cord was drawn tightly through the pipe and tied at the centers of the disks. A ring of rubber packing, with a 1½-in. circular opening in the center, was cemented to the upper edge of each funnel. By placing the packing ring on the engine, or machine, under inspection, a slight pounding in it will be heard distinctly at the other end of the device. Care must be taken that the cord is taut, and does not touch the pipe.—R. S. Matzen, Fort Collins, Colo.



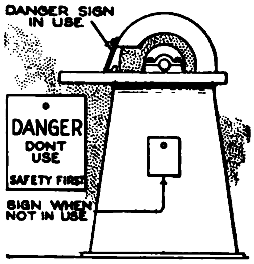
Pounding in Machinery may be Heard Distinctly by the Use of This Telephonelike Device

¶A small V-shaped notch cut in one jaw of a vise, ⅛ in. deep, will be in no way objectionable for other work, and has many uses. It gives a three-point bearing on work held verti

Clip Supports Brush in Pail

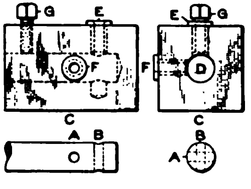
Paint brushes are injured by being permitted to stand in the paint pail when temporarily not in use. By fastening a small metal clip to the side of the brush on the wooden part above the bristles, the brush may be hung on the edge of the can or on a wire stretched across it, the bristles hanging straight instead of being curled against the bottom of the pail.

Danger Sign for Unsafe Grinding Wheel



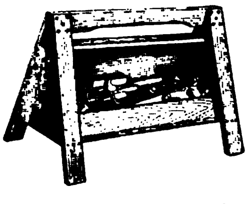
A workman cannot readily observe whether a grinding wheel is damaged or unsafe, particularly when the wheel is properly hooded. A safety measure used in a large shop is that suggested in the sketch. When a grinding wheel is found to be unsafe, a red danger sign usually kept on the side of the machine, is fastened to the front of the grinder.—J. R. Minter, Washington, Indiana.

Jig for Drilling Holes at Ends of Shafting



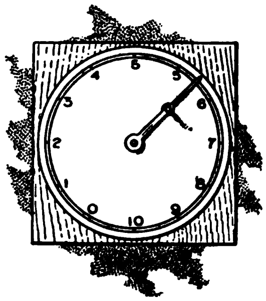
Holes like A and B, as shown in the sketch, near the ends of sections of shafting, and at right angles to each other, were drilled by the use of the jig shown. The body C is of steel with a hole for the shaft D, and drill bushings E and F. The setscrew G keeps the shaft in place while the first hole is being drilled. After one hole has been drilled, a pin is inserted, counteracting the tendency to twist the work on the second hole.—L. J. Hansen, Chicago.

A Sawhorse Tool Kit



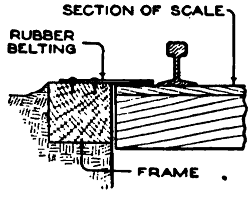
For mechanics, carpenters, or for use in odd jobs around the home or shop, the sawhorse tool kit will be found useful. It serves the double purpose of a convenient container and carrying case, and a lightweight horse. The trestle is of the common form and the tool kit is built into it by paneling the ends and one side, around a lower shelf.—J. B. Butler, Morganfield, Ky.

Decimal Dial on Shop Timekeeping Clock



A large structural steel and bridge company has adopted the dial shown, for timekeeping clocks. Zero is at 7 a. m., the start of the day's work; 5 at 12 a. m. and 1 p. m., the lunch hour; and 10 at 6 p. m., the end of the day's work. A single hand is used, and the hours are divided decimally, simplifying timekeeping on the various jobs.—Peter W. Seiter, Kansas City, Mo.

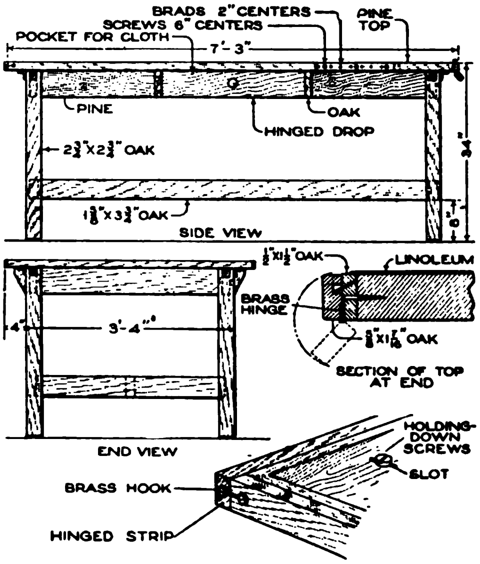
Keeping Dirt Out of Scale Pit



Discarded rubber belting was fastened to the frame around a scale pit, and lapped over the platform, as shown, to prevent gravel, dirt, and other small particles, from working down into the scale pit. The rubber belting does not interfere with the scale in weighing.

Table for Mounting Drawings on Muslin or Backing

A good method of mounting muslin backing on a drawing, or blueprint, is as follows: Stretch the muslin on a board, or table, as shown, and tack it around the edges. The stretching should be uniform and should not distort the fabric. Dip the drawing to be mounted in water for about a minute and remove the surplus water between blotters. Place it, face down, on the table and evenly coat the back with paste. Turn it over, put the muslin on, and roll it down flat, working from the center outward. A mounting table, large enough to hold eight or a dozen drawings, is of great assistance, and can be used for other purposes as well. The table, shown in the drawing, is covered with linoleum, an excellent top. When it is desired to mount drawings, a hook at each corner is unfastened, permitting an oak strip on each side to drop down, exposing a row of sharp points, as shown in the detail. The muslin is stretched over these points, which are hidden when the table is used for general purposes.—John D. Adams, Phoenix, Ariz.



This Large Table, Designed for Mounting Drawings Quickly, Is Also of General Use

---

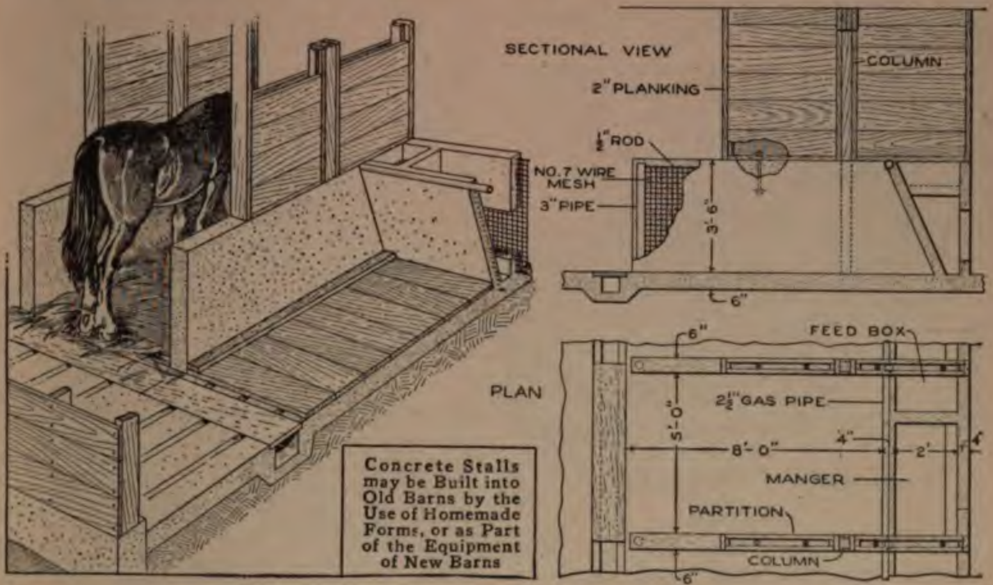
¶A piece of corrugated cardboard is a convenient drier for photographic prints, the ends of the prints being arched in the corrugations, giving a current of air easy access.

Horse Stalls of Concrete

By W. E. FRUDDEN

Serviceability and sanitary considerations make concrete desirable for the building of horse stalls. The illustration shows stalls of this type that may be built into a new structure in various units, or fitted in an old one. The floor, drain trough, feed box, manger, and partitions are built as a unit, and wooden partitions are set above the concrete sections. A removable plank floor in the stalls gives the horses foot comfort, not possible upon even a heavily bedded concrete floor. The concrete partitions and the mangers are reinforced with wire mesh and steel pipes. The front edge of the manger is also guarded with a pipe, so as to prevent undue wear on the harness. The edges and corners of the exposed concrete should be rounded off so as to prevent injury to the horses from accidental contact in entering and leaving the stall. A stall in use and another in section are shown to the left in the sketch; a plan view is shown at the right, together with a detailed sectional view of the construction of the partitions and manger.

The floor is laid down first, and of the same material used for the other concrete portions, a 1 to 2 to 4 mixture. A weaker mixture may be used for the floors if there is a considerable area to be laid. The drain trough, 6 by 6 in. in section, is cast with the floor, a box of $\frac{7}{8}$-in. stock being fitted into the floor as a mold. The shallow drain grooves may be tooled into the



Concrete Stalls may be Built into Old Barns by the Use of Homemade Forms, or as Part of the Equipment of New Barns

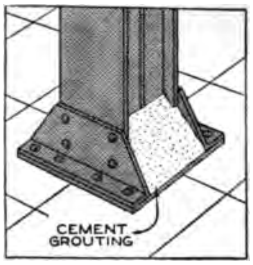
surface, and the offsets at the top of the trough are provided by strips fixed to the trough mold. The 3-in. pipe, reinforcing the partitions at their rear ends, is set into the floor when the latter is laid, and it is desirable, also, to set the lower edges of the wire-mesh reinforcement into the floor.

Wooden forms are provided for the partitions and the manger. These should be built to be taken apart readily so that they may be used repeatedly. The form for the partition is a box in which the wire mesh is supported, taut and carefully centered, the mixture being poured into it and leveled at the upper surface. The forms for the manger and feed box should be set into place and fixed to the partition forms before any of the forms are filled. The inside of the manger is formed by a tapered box resting upon the floor. The feed box is poured around a similar but smaller form, and the portion below it is cast hollow by inserting a form, which remains in place after the concrete is poured into the molds. A 2½-in. pipe is set into the front edge of the manger, its ends being imbedded in the partitions, to protect the horses from the edge of the manger and to prevent heavy wear on the harness. Bolts to support the upper portions of the partitions are set into the concrete, as indicated in the sectional view.

The mixture must be freshly mixed and thoroughly wet when being poured, in order that the molds may be filled properly. If necessary, the aggregate may be tamped into the molds slightly. The forms should be left in place three days, and then removed carefully, so as not to damage the concrete. Sprinkling the work occasionally, several days after the forms are removed, is also desirable as an aid in uniform drying. The surfaces should be smoothed by removing imperfections in the molds, and a mixture of cement and water should be brushed over them to produce a satisfactory finish, when the molds are removed. The work may be surfaced and troweled smooth if desired, but this is not essential.

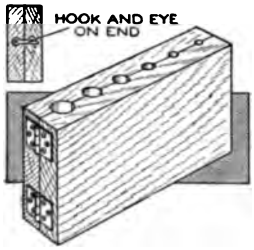
The floor planking is laid crosswise and spiked to 2 by 4-in. pieces set at the sides of the stall. This arrangement makes it convenient to replace pieces of the planking where the greatest wear occurs, and the planking may be removed readily for flushing of the stall.

Dirt-Collecting Corners Filled with Cement Grouting



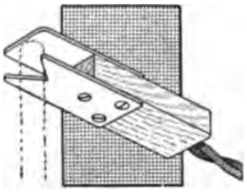
Column footings and similar corners in a factory were filled with cement grouting, as shown, overcoming the unsightly dirt accumulations. The floor may be washed with water from a hose, in many instances, and the fire risk from inflammable materials collecting in corners is reduced, and sanitation promoted.—Roy H. Poston, Flat River, Mo.

Vise Pads for Polished Tubing or Rods



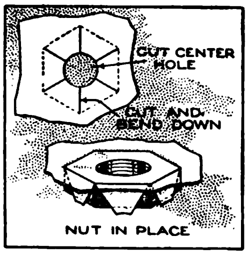
If a length of highly polished pipe, or rod, is placed in a metal vise, it is usually marred or dented. The pads shown eliminate this. The holes are bored in a suitable board, about 1½ by 6 by 18 in., which is then sawed in two, as indicated, and hinges and a hook and eye are attached. It may also be given a coat of shellac. —Arthur W. Dahl, Superior, Wis.

An Electric Gas Lighter



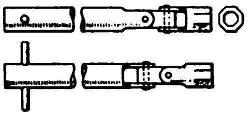
For lighting gas burners used intermittently, the lighter shown in the sketch was found satisfactory. A piece of wood, ⅜ by ¾ by 3 in., was provided with two pieces of metal, and the two conductors were connected through a central hole to them. The other ends of the cord were connected to a 110-volt lighting circuit, in series with a small choke coil. When it is desired to light the gas, it is only necessary to turn it on and then place the lighter over the tip of the burner, moving it slightly to produce sparks. A coil of 10 or 15 ohms, having an iron core, will produce a sufficiently hot spark without endangering the usual 10-ampere fuse. The two metal contact pieces should be taped except on the ends projecting from the wooden handle.

Soldering a Machine Nut to Sheet Metal



In fitting a can to receive a tap it was necessary to solder a nut securely to it and the method described was used. It has numerous other applications. The nut was placed on the metal and a line drawn around it, as shown. The center hole was cut and the six portions of the hexagon were cut and bent down. The nut was supported by them and soldered into place. A very strong fitting resulted. —J. H. S. Cronk, Woodstock, Canada.

A Flexible Socket Wrench



For use in places where an ordinary wrench cannot be applied, a flexible socket wrench is useful. It is a homemade device, the socket portion being formed from a short piece of iron pipe and the other sections from steel pipe. It may be made in various sizes and provided with several sizes and shapes of sockets, which can be fixed into place as desired, by means of the pin.—Charl C. Brabant, Detroit, Mich.

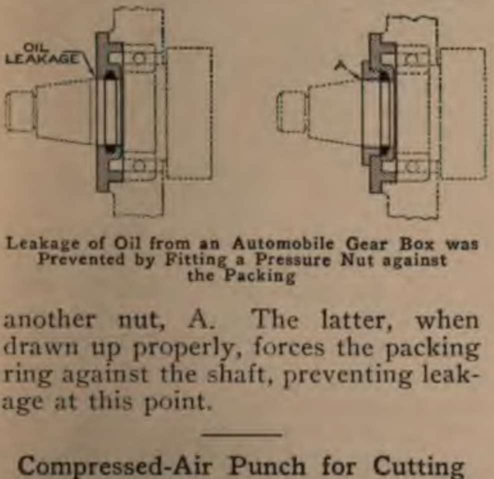
¶Putty for glazing should
per cent of whi
weather.

Japanese Finish for Spruce

A finish used on spruce by Japanese craftsmen is produced by the application of dilute sulphuric acid, after which the surface is charred slightly. The acid is permitted to dry and the wood is then held over a hot stove, until the surface is well blackened. The charcoal surface is brushed off thoroughly, and the surface oiled with linseed oil and beeswax. The harder grain appears black and the rest has a rich brown tone.

Preventing Oil Leakage in Gear Box

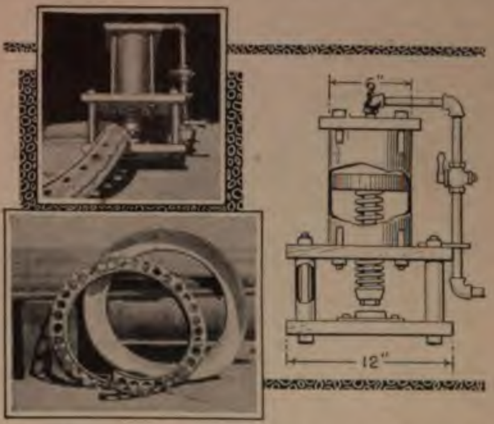
Occasionally trouble is experienced from leakage of grease or oil out of the ball bearings of an automobile gear box, as shown in the sketch at the left. This is usually due to the failure of the felt ring within the ball-bearing nut to press closely around the shaft. Such a condition was overcome by turning out one side of the nut that holds the felt packing, and threading it to receive another nut, A. The latter, when drawn up properly, forces the packing ring against the shaft, preventing leakage at this point.



Leakage of Oil from an Automobile Gear Box was Prevented by Fitting a Pressure Nut against the Packing

Compressed-Air Punch for Cutting Washers

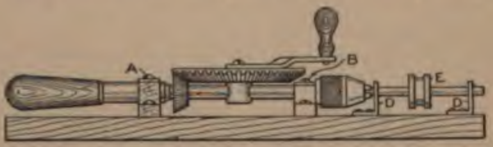
A punch for making washers, and the automobile tires from which the latter were cut, are shown in the illustration. The punch is operated by compressed air. The cylinder is 6 in. in diameter and the piston has a stroke of 3 in. A heavy coil spring in the [illegible]y under the piston, lifts the punch after it has cut a washer. The lower spring strips the washers from the punch. The lever on the two-way cock controls the air, and when pulled down, permits the air to force the piston down for the cutting stroke. When the lever is raised, the air escapes as the spring lifts the piston. Tire casings were used with this device to make packing washers for oil-well pumps, and washers for other uses can be made similarly.—F. R. Shepherd, Fellows, Calif.



Old Automobile Tires were Cut into Washers with This Device

Hand Drill Used as Lathe

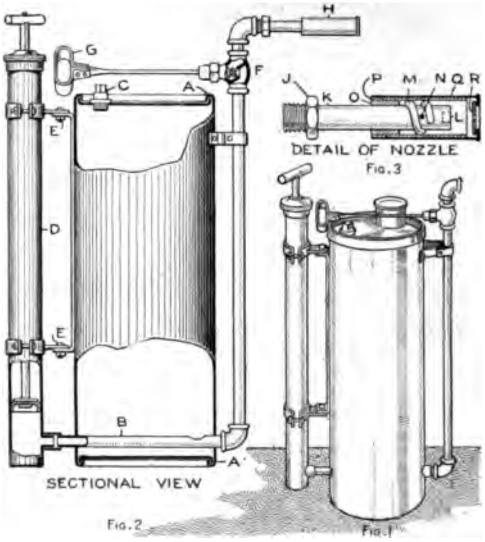
An ordinary hand drill was used effectively as a small lathe in turning a number of brass pulleys, by rigging it as shown. Two wooden bearings with metal strips, A and B, hold the drill firmly on the baseboard. An arbor is held in the drill chuck, and supported on two metal angles, D. The pulley E was drilled and forced on the arbor, and a suitable support for hand-turning tools was provided.—R. C. Fulton, Scarsdale, N. Y.



Small Brass Pulleys were Turned by Means of This Makeshift Lathe

A Garden Sprayer of Varied Uses

Primarily for use in spraying plants in a garden, the sprayer shown in the sketch, Fig. 1, and made at small cost in the home workshop, is useful also in the garage, on the farm, and for other purposes. The tank A, Fig. 2, is 5 by 14 in., and operates satisfactorily at a pressure of about 15 lb., when used with ordinary liquids for plants. It is made of No. 26 gauge galvanized iron, the ends being riveted into place. It is filled at the pipe plug C. The pressure pipe B extends through the tank, and is connected to the pump D, a ball valve, originally in the connecting tube when the pump was used as a foot bicycle-tire pump, being at the junction, and controlling the back pressure. Straps E support the pump.

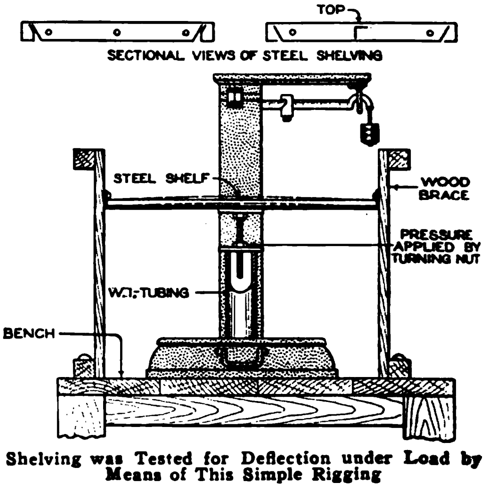


A Revolver Cartridge Shell was Used in Making the Nozzle of This Handy Garden Sprayer

The liquid passes through the tube B to the valve F, controlled by the handle G, convenient to the pump, by which the sprayer is carried. When the valve is opened, the liquid is driven into the nozzle H, which is shown in detail in Fig. 3. The threaded ⅛-in. nipple J fits into the elbow, and is soldered to the $^3/_{16}$-in. copper pipe K, which is plugged at the end L. A $^1/_{16}$-in. hole, N, is bored in the tube, and two turns of brass wire, M, soldered into place, produce a spiral course for the spray. The brass tube O, soldered to the tube P, is set on the tube K, with a tight fit. The cap Q is a .38-caliber, long cartridge shell, sliding tightly on tube P. The end of the shell is drilled out, and the disk R, having a $^1/_{16}$-in. hole, is soldered into place. In filling the tank, sufficient air must be left in it to afford the proper possibility for compression. The parts, especially of the nozzle, should be cleaned after use.—T. T. Sturgeon, Los Angeles, Calif.

Test of Steel Shelving for Deflection

A manufacturer of metal shelving desired to test it as to deflection under various loads. No special apparatus was available, and the arrangement shown in the sketch was devised for the purpose. The shelving, which was of various types, was supported on a wooden frame bolted to a bench. A scale was set into place below it, and a simple jack made by setting a bolt into a washer in the top of the tubing, as shown. The pressure was appli
means of the screw and nut.
shelves were defle
specified for
Selander

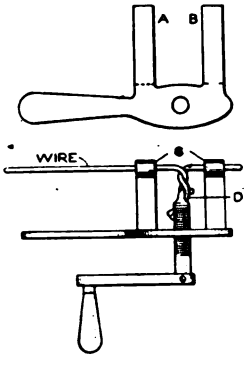

TOP
SECTIONAL VIEWS OF STEEL SHELVING
STEEL SHELF
WOOD BRACE
PRESSURE APPLIED BY TURNING NUT
W.I. TUBING
BENCH

Shelving was Tested for Deflection under Load by Means of This Simple Rigging

Painting Quick-Drying Cloth Signs

Where cloth, or muslin, signs are wanted for temporary use, exposed to the weather, letter them with a paint made without oil. Use dry colors of fine quality and grind them with varnish or japan to a thick paste; then thin out with benzine when ready for the work. If too thin, the paint will spread. Use a sign writer's one-stroke brush, and if especially good wearing qualities are desired in the paint, add a small quantity of boiled oil to the letter color.—A. A. Kelly, Malvern, Pa.

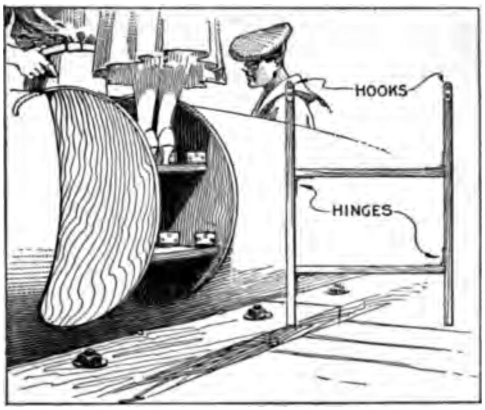
Device for Tightening Fence Wire



A large length of loose fence wire was tightened by the use of the device shown in the sketch, made for the purpose. A piece of ¼-in. iron was shaped to form a handle, and the two ends A and B were bent at right angles to it to form the upright parts. These may also be made by riveting pieces to the handle portion. Their upper ends, at C, were formed into eyes, left slightly open. A hole for the threaded crank was made in the handle section, and the pointed end of the screw bent into a hook, at D. The wire is tightened by looping it over the hook and turning the crank.—R. S. Matzen, Fort Collins, Colo.

Collapsible Steps for Boarding a Boat

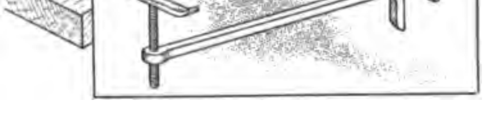
Boarding steps for launches and small yachts are often bulky to stow away on the craft. The type shown in the sketch packs flat, takes up little space, and is safe and substantial. The [illegible] hard wood, are [illegible] boat. Two [illegible] to fit [illegible] The treads are 18 by 10 by ⅞ in., placed 12 in. apart. They are set horizontally by hanging the sidepieces in place, and marking the proper position. Strap hinges are fixed as indicated, and rubber treads provided.—L. B. Robbins, Attleboro, Mass.



The Steps Fold Flat for Convenient Storage on Board the Craft

Support for Long Work in Vise

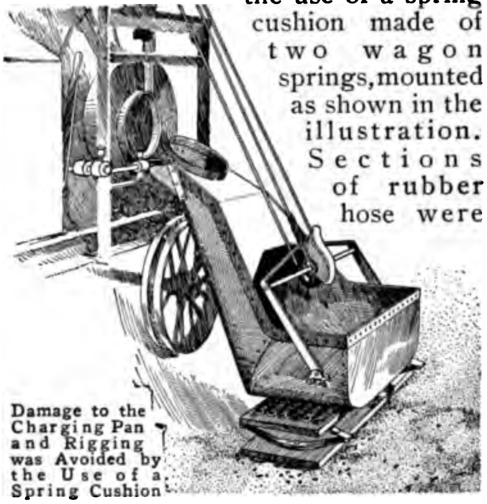
Blocking-up, or other makeshift, methods of supporting long work in a vise were discarded in a shop, in favor of the simple arm fitted to the sliding member, as shown in the illustration. The device is especially useful on a pivoted vise, since it revolves with the latter. The extreme end is provided with an adjustable screw to fit irregular work.—S. L. Wade, Montgomery, Alabama.



This Simple Support Makes Unnecessary the Blocking Up of Long Work in a Vise

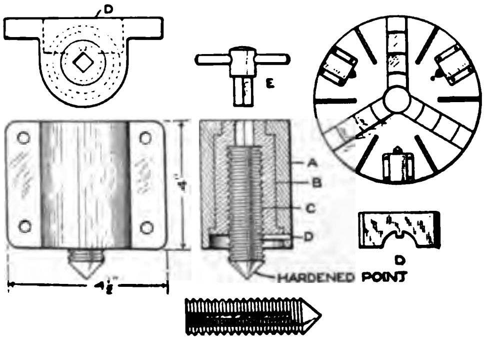
Cushion for Charging Pan of Concrete Mixer

Cable breakages on the lifting rigging and damage to the charging pan of a concrete mixer were avoided by the use of a spring cushion made of two wagon springs, mounted as shown in the illustration. Sections of rubber hose were nailed on the top of the upper board of the cushion as a further protection to the charging pan.—J. J. O'Brien, Buffalo, N. Y.


Damage to the Charging Pan and Rigging was Avoided by the Use of a Spring Cushion

Auxiliary Jaws for Center and Turret-Lathe Chucks

In turning a number of castings which were too large for the ordinary-size lathe chuck, it was found desirable to make a set of auxiliary jaws, which were fastened to the face of the chuck, as shown in the sketch. The casing A is made of soft steel, the sleeve B, of steel, tempered at the upper end, which is provided with a socket for the wrench E. The screw C is of tool steel, tempered at the point, and has a keyway, as shown, which extends longitudinally at the back of the casing. This keyway engages the key D, which is set in a slot at the back of the casing and has its back edge flush against the face of the chuck. The screw is adjusted by means of the wrench E, which causes the sleeve B to revolve. —G. T. E., Pittsburgh, Pa.



This Auxiliary Fitting for a Chuck Made Possible the Handling of Large Castings in a Lathe

Tightening a Loose Bushing

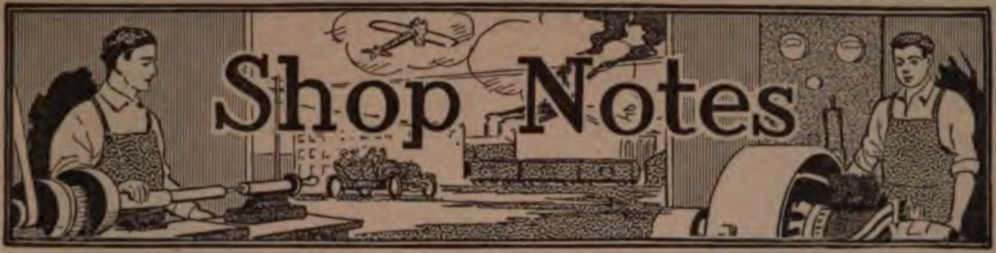
Sometimes, after pressing bushings into their places, they are loose and turn when an attempt is made to ream them out. In this case, remove the bushing, and run a coat of solder around the outside of it. Force the bushing back into place and the excess solder will be scraped off and a tight fit will result, with no turning of the bushing in reaming it.—J. W. Reynolds, Mason, Ill.

Kink in Cultivating Small Corn

When corn is small, it is difficult to do a good job of cultivating it, because of the tendency to cover it with earth. By wrapping the shovels of the cultivator next to the row with binder twine, the dirt is not pitched on the small corn, and it is possible to work close to the plant, the binding aiding in breaking up the lumps of soil.—Irl R. Hicks, Moberly, Mo.

A Polished-Black Wood Finish

A finish for woodwork in a high-polished black is produced as follows: Prime the work with linseed oil, turpentine, and white lead; apply two coats of black mixed with turpe
and copal varnish. Rub this dow
pumice stone
another c
and p
ro



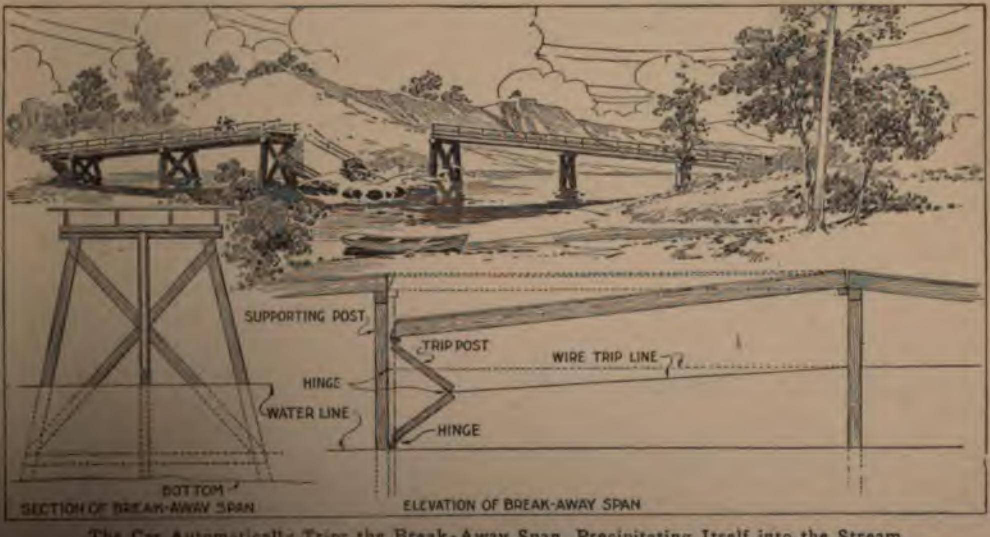
A Collapsing Bridge for the Movies

By RALPH CUMMINS

A MOVING-PICTURE bridge has one span so constructed that it can be broken away, precipitating an automobile, a carriage, or a horseman into the stream. Many movie fans are curious to know by what mechanical means this thriller is effected. Boys and others interested in making models, for play or diversion, will find a miniature bridge of this kind a novelty. A sure means of tripping the section is necessary, for the fall must be timed just right, so as not to spoil the picture and make necessary an expensive "retake." The tripping apparatus, shown in the sketch, is one that I have used successfully on bridges, towers, and walls. The principle is simple: Two hinges are placed on opposite sides of the trip post—a 4 by 4-in. piece upon which one end of the span rests. A piano wire stretched from the upper hinge to a point opposite the break-away section, forms the means of tripping. When an automobile is used, a wire can be run through pulleys in such a manner that the machine trips the break-away span at the proper instant.

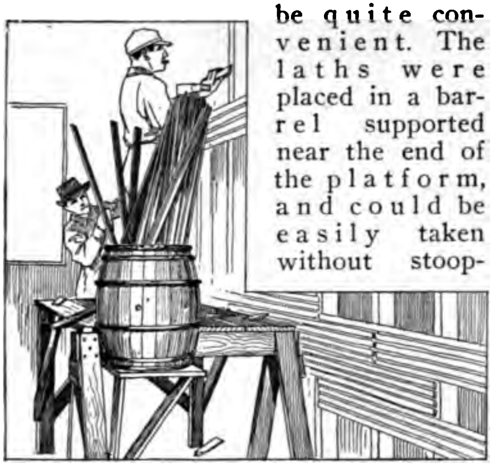
Painting Cold-Water Pipes

It is very difficult to obtain a satisfactory painted surface on cold-water pipes, because of the condensed moisture which collects on them. The water should be run out of the pipes and a thin coat of shellac applied after the surface has been dried thoroughly. Bronze aluminum, dusted over a preliminary coat of copal varnish, or over the shellac, which dries quickly, produces a neat finish.—A. Ashmun Kelly, Malvern, Pa.



The Car Automatically Trips the Break-Away Span, Precipitating Itself into the Stream

Quickly Made Stand for Lathing

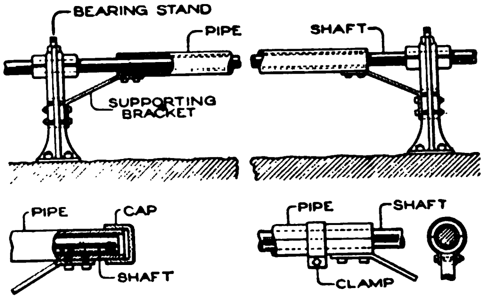


The Rapid Work of the Lather is Made Even More Speedy by the Use of This Stand

In lathing I found a stand built up on a horse and braced, as shown, to be quite convenient. The laths were placed in a barrel supported near the end of the platform, and could be easily taken without stooping. The platform is light and easily moved. It is so cheaply made that after a job is finished it can be knocked down and only the horse taken to another job, if desired. The barrel used was a nail keg, like those obtainable at most buildings in construction.—John S. La Fleur, Haverhill, Mass.

Safety Guard for Exposed Shafting

Suitable coverings for exposed shafting should be provided as a safety measure. If the shafting is already in operation and cannot be taken down handily, a pipe may be cut into halves longitudinally in a keyseating machine and the parts clamped together with straps of sheet iron, when in position. A typical installation is that between bearing stands, to which the pipe is braced with brackets, as shown. Exposed ends of shafting are protected with a pipe and cap, as detailed.



The Workmen are Protected from Exposed Shafting by Pipe Coverings

Locating Trouble in Automobile Starters and Generators

After a season's use, the automobile starter and generator should be carefully examined to make certain that its efficiency is up to standard. The starter may lack the necessary turn-over torque, especially when the engine is cold and spinning is difficult. The generator may heat up rapidly or fail to charge the battery properly. Before taking the motor or generator apart, go over every external connection to see that there are no grounds, breaks, or shorts. Examine the starter foot switch to make sure that the electrical contacts are in good condition. Note, also, the condition of the battery, whether it needs water or acid and that its voltage is sufficient. As for the generator, pay special attention to the relay to see that cutting-in occurs at the proper engine speed. This speed should average eight or ten miles an hour, for most generators. If trouble is experienced with the sticking of relay contact points, a small flat file should be used to smooth the contacts, care being taken to see that they meet evenly. An ordinary finger-nail file will serve the purpose. Still failing to locate the trouble, inspect the machine internally. As a rule, very little difficulty may be traced to the field coils, but a close examination of the armature and commutator is suggested.

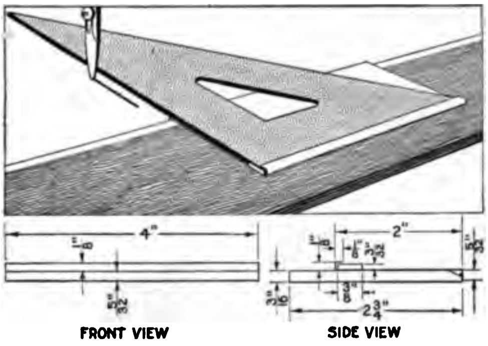
Bad sparking at the brushes is generally a sign of high mica. A ground in the armature winding is caused by contact of the winding with the armature core. A careful examination should show the weak point in insulation.

The last test to be ma
broken lead wires
piece of sheet

brushes, so that only one commutator bar at a time is touched. A single dry cell should then be connected, through an ammeter, to the metal brush and to the next carbon brush. Turn the armature very slowly by hand, so that the metal brush may make sure contact with each commutator bar in succession. Unless the design is very special, there will be two lead wires soldered to each bar. A reduced deflection will indicate a break in one lead, and no deflection, a break in both, when the metal brush passes over the bar to which the faulty leads belong.—K. M. Coggeshall, Webster Groves, Mo.

Triangle Holder Aids in Inking Drawings

It is often desirable, for rapid work in tracing, to draw ink lines with a triangle over lines that are wet. It is hard to do this without making blots. I made a protector, as shown, with which it is easy to move the triangle over wet lines, at the same time keeping it at right angles to the T-square. The device is made of metal, sheet aluminum being preferable. The size may be varied, that indicated being suitable for smaller triangles.—Howard Scott, Jersey City, N. J.

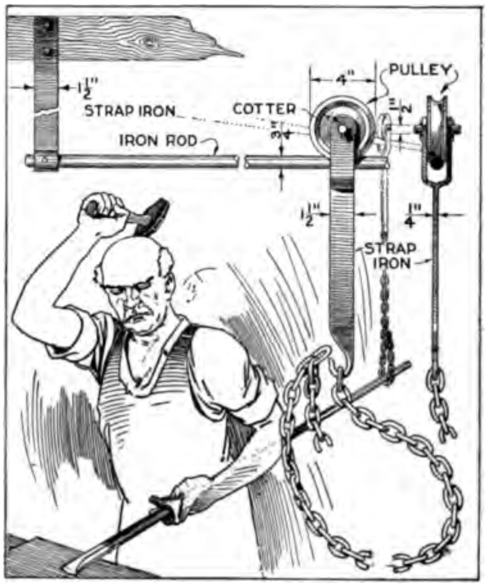


The Device with the Triangle in It is Moved in the Usual Manner

CA **ned soldering iron a rough or**

Traveling Pulley-and-Hanger Support at Anvil

In the small forge shop where long pieces must be handled occasionally, as well as in the shop where drills and similar tools are sharpened, the pulley-and-hanger arrangement shown in the illustration is convenient. The rod on which the pulley travels is supported from the joists. A forged hanger supports a chain sling which is adjustable to various sizes and shapes of work.—John E. Cahill, Jr., New York, N. Y.



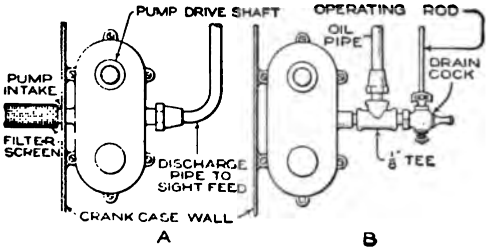
This Support was Made for Handling Long Rock Drills, and Has Many Other Uses

Orchestra-Pit Rail Used as Speaking Tube

Musicians and the leader in an orchestra often wish to communicate with each other, which in a large orchestra is inconvenient. By cutting 1-in. openings in the pit rail at each player's chair in a local theater, and connecting the rail to a tube at the leader's station, means of communication was provided. At more expense, speaking tubes may be installed along the rail, but the plain openings proved a success.—Jack Wolmer, Marion, Ind.

Remedy for Unreliable Auto-Oiling System

Many small automobiles are equipped with a constant-level splash system of engine lubrication in which a shaft-driven gear pump draws oil from a chamber cast in one piece with the lower part of the crank case. This pump discharges the oil through a copper tube to a sight-feed fitting on the dash, from which it goes to the crank case by gravity. In one such case frequent stoppages of the oil flow were experienced, and when the parts were cleaned, little dirt was found, and the system worked temporarily on reassembly. An air lock was found to be responsible, and the change shown in the diagram was made to overcome the difficulty, the old arrangement at A, and the new at B.



Frequent Stoppage of the Oiling System was Overcome by the Installation of a Drain Cock

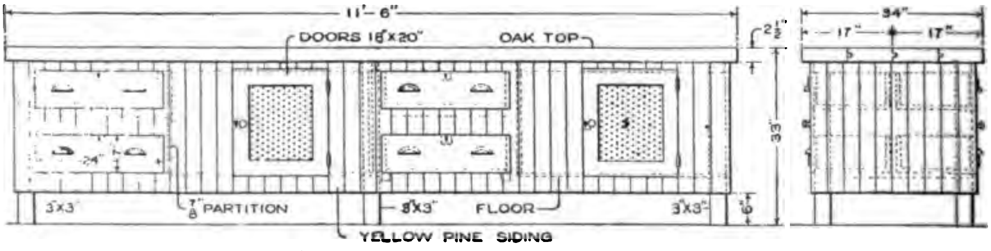
A change in the piping was made, as shown, the other fittings being undisturbed. The regular discharge fitting was attached with a tee. A petcock was placed opposite the discharge and an operating rod for it was run up to the top of the engine. As soon as the oil feed stops, it is but a minute's work to open the petcock, and allow a small quantity of oil to be pumped out. When this is then closed, the oil flows through the discharge pipe, whether the stoppage was due to an air lock or to dirt.—Victor W. Pagé, Bristol, Connecticut

Testing the Atmosphere in Polishing Rooms

A test for detecting metallic dust in the atmosphere of a polishing room may be made by placing a lighted Bunsen gas burner in the middle of the room, about 4 ft. from the floor. When steel and iron particles float in the atmosphere, the dust comes into contact with the flame, as indicated by the sparkling of the flame. The presence of brass dust is indicated by an intense greenish color. This simple device is valuable for the inspection of blower systems, intended to clear the air.

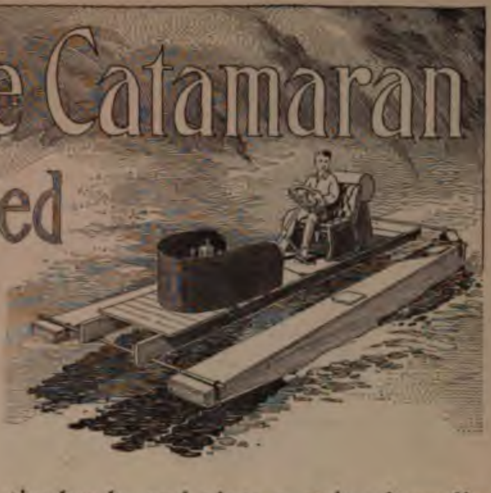
A Workbench for Use Singly or in Multiple

This heavy workbench was designed for use in engine houses and small railroad shops where room is at a premium, and can be adapted for the use of machinists, carpenters, pipe fitters, boilermakers, and other mechanics who need a substantial bench. It accommodates four men, but can be arranged to be used in two sections. Two drawers are provided for each workman, and also a large cupboard with a screened door. The construction is such that the bench can be made quickly by machine or hand process, and there are no out-of-the-way corners to catch dirt.—Joseph A. Long, Sunbury, Pa.



A Substantial Workbench of This Type may be Used in Single or Double Units for Heavy Shop Work

A Hydroplane Catamaran Built for Speed



By L. B. ROBBINS

THE building of this 16-ft. power boat of the catamaran type, involves no special skill in boat construction, and it is designed to be made without the bending of planks, ribs, etc., by mechanics having only a fair knowledge of handwork with tools. The craft is for use on fairly smooth water, and with a 4-hp. motor, develops a speed of 15 miles an hour. For greater speed with a more powerful motor, the size of the catamaran must be correspondingly increased. The bottoms of the hulls have steps, turning them into simple hydroplanes, and increasing their speed quality. The open structure simplifies the mounting of the power plant and its driving connections, as compared with conditions met in ordinary motorboats. The perspective sketch in the headpiece of this article, and the plan and elevations, Figs. 1, 2, and 3, show the general arrangement of the parts.

Cut the sideboards from ¾-in. pine. They fit between the top and bottom, and over the ends. Begin the construction with the hulls, detailed in Fig. 4. All of the wood used should be first-quality stock. Plane the edges square, and fasten the 1-in. battens into place with screws, applying white lead under them, on the inside of each sideboard, except at A, Fig. 4, where a bulkhead supports the structure. Coat the inside of the sides with marine paint.

The bow piece B is of oak, 2 in. sq. and 1 ft. 1½ in. long, and the stern piece C is of 1-in. pine. Fit the pine bulkhead A water-tight, the rear surface of it flush with the step. Fasten the end and bow pieces, and the deck board, painting the inner surfaces. Use 2-in. brass screws, countersinking the heads, and place a strip of muslin soaked in white lead between all joints. Cut the holes D, and fit them with plugs. These holes are for filling in or pumping out ballast to distribute the weight properly. Scrape off the excess white lead, sandpaper the surfaces, and fill the screw holes with white-lead putty, and apply two coats of marine paint to the hulls. Next construct the deck of matched boards mounted on two 2 by 6-in. spruce timbers, 16 ft. long. These must be of fairly straight grain, and of very good quality. Set the timbers on edge and taper them to 5 in. at the ends, into a truss effect. Place the timbers, as indicated, 2 ft. apart, arched edges uppermost, and nail on the ¾-in. matched pine deck boards 3 ft. long. Leave 1 ft. of the timbers uncovered at the ends. Leave two openings forward, the size and position of them depending on the motor used. The center of the engine bed is 4 ft. 6 in. from the bow and heavy boards are laid for its support. Notch the timbers, 6 in. from the ends, and fit them with iron straps, bolted on, as detailed, to accommodate the supporting end shafts.

An old automobile seat and round gasoline tank is mounted on the frame, as shown, making certain that the bottom of the tank is higher than the carburetor of the motor. The seat and tank are set about 10 ft. 6 in. from the bow, to obtain an even distribution of weight. An auto steering wheel and column, fitted with a wooden drum, keyed in place, is used. A bracket near its base supports the post.

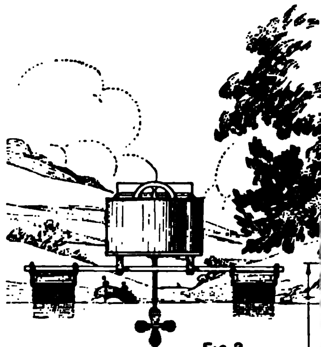


Fig.3

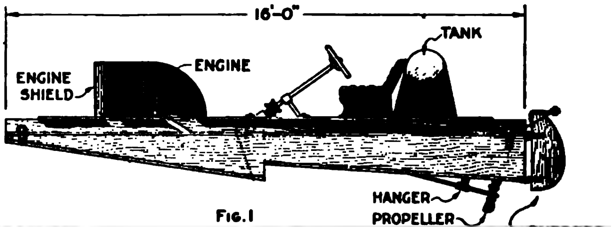
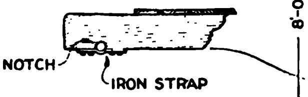


Fig.1



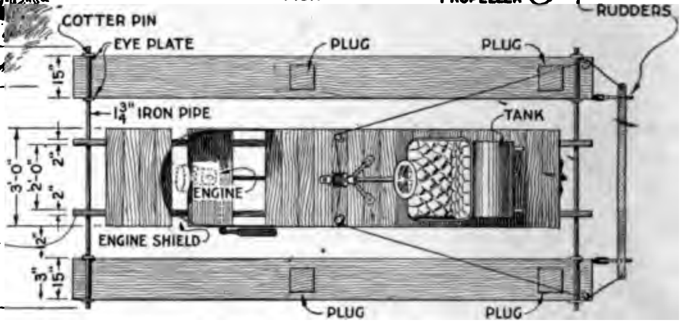


Fig.2

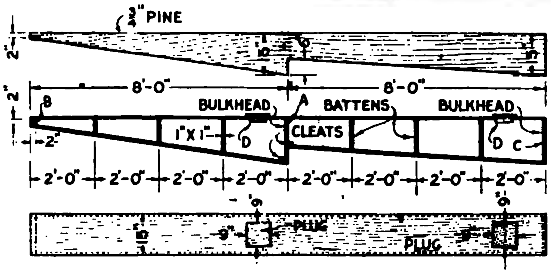


Fig.4

The Hydroplane Catamaran Is an Interesting Craft, the Making of the Supporting Structure Being Quite Simple as Compared with the Building of Ordinary Motorboat Hulls

The deck is next fitted to the hulls. Eye plates, as shown, hold the end rods carrying the long timbers. The plates are secured with screws, 6 in. from the ends of each hull. An 8-ft. length of 1¾-in. galvanized-iron piping is slipped through the sets of eyes, and through the notches of the deck timbers; cotter pins hold the piping in place. The straps at the ends of the timbers keep the deck frame in position on the piping.

Two rudders of thin oak or of sheet metal, as shown in Figs. 1 and 2, are hinged to the inner edge of each hull. An angle of strap iron at the upper edge of each rudder is bolted loosely to a bar of iron or wood, so that the rudders operate together. The steering rope is rigged through pulleys, as shown, and wound around the drum on the steering column.

The installation of the motor will depend upon its style and size. The usual connections of the gasoline supply and electrical equipment are, of course, provided. The batteries and coil are placed under the seat, and the wire connections carried in rubber hose. Heavy oak or ash engine timbers are bolted to the flooring for the engine bed, arranging the pitch so that the propeller will rest about 6 in. under water. Bolt the hanger for the propeller shaft to the floor boards, as shown in Fig. 1. A spray hood, of canvas over an iron frame, or of sheet metal, protects the motor.

Punching Hard Sheet-Rubber Washers by Hand

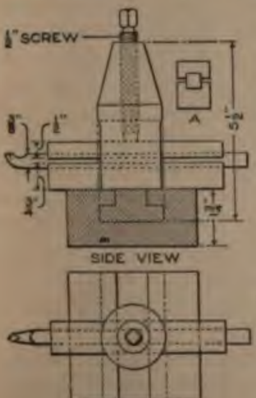
Vulcanized, or hard, sheet rubber may be worked with shears or ordinary leather punches, using stock ⅛ in. in thickness, by gently heating the part to be cut, and sometimes heating the tool also. To cut a hard-rubber washer from a piece of flat stock, two leather punches, a large on
out the blank, and a
punch out the c

stock on a flat piece of lead, or other fairly soft metal, heated just sufficiently to cause the rubber to become pliable, so as not to crack when the punch-strikes it. The washer will cool flat if laid on a flat surface. Hard-metal tubing is suitable for cutting the stock, if properly sharpened, and other shapes may also be cut.—F. L. Whitaker, Olney, Ill.

Padded and Flexible Paper Weights

For weighting large maps and drawings, standard square 2 or 2½-in. nuts, with a layer of cotton waste or cloth padding, about ¾ in. thick, evenly wrapped about them and covered with strong paper or cloth, are excellent and inexpensive. A smooth leather bag, 3 in. square, filled with small lead shot or dry sand and securely sewed, makes a good paper weight that is very flexible, and if accidentally dropped on a drawing, does it no injury.

Tool Holder for High-Speed Steel

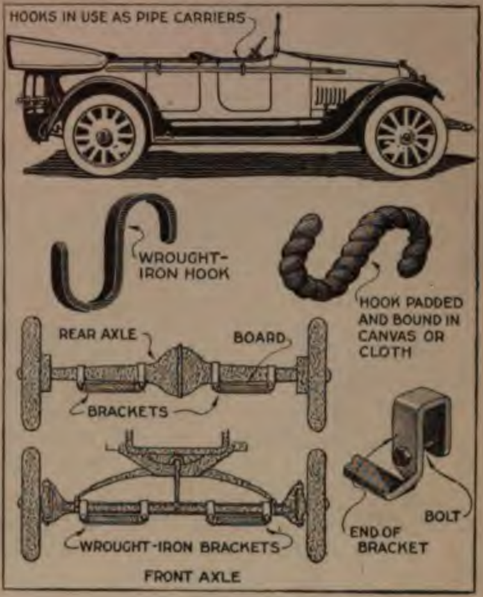


By the use of this tool holder, high-speed steel need not be broken into short lengths, but may be fed forward as required. The holder was designed for a medium-sized lathe tool post, and the device may be made strong enough for use on a shaper or planer, and to withstand heavy cuts. It consists of two sliding members of machine steel, grooved to fit the tool steel, as indicated at A, and is clamped in the tool post in the usual manner.—C. A. Gilson, Niles, Mich.

¶Undue forcing in photo development is indicated by a tendency of the fixed [illegible] the wash water.

Detachable Hauling Brackets on Passenger Auto

Two simple methods of adapting an automobile quickly for business purposes are shown in the sketch. The S-shaped wrought-iron hooks, padded in cloth or canvas, are used by a plumber to convey long sections of pipe handily. The brackets are used by a paper hanger in transporting scaffolding. They are made of wrought iron, as shown, to conform to the axles of the car.—G. A. Luers, Washington, District of Columbia.



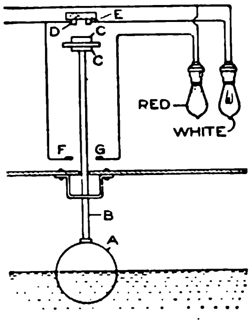
These Devices Are Useful in Carrying Pipes, Ladders, Fish Poles, and Similar Articles

Hay Carrier Rigged to Handle Excavation Dirt

In digging a cellar under my house, how to remove the dirt was a problem. I made a track for my hay-carrier tripping pulleys and hanger of 1 by 4-in. boards. I then made a strong box, 1 by 2½ by 3 ft. in size, and attached it to the carrier in such a way that by loosening a hook it would dump easily. With this arrangement one man took out an average of 7 cu. yd. a day.—J. H. Knight, Cumberland, Ohio.

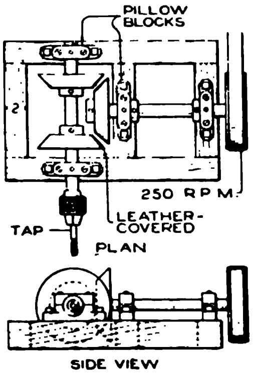
High and Low Water-Level Indicator

This easily made water-level indicator is in daily use and was worked out by me. Where the supply tank is located so that it is not visible from the pump house, such a device is reliable and convenient. Branch wires from an ordinary lighting circuit are run to the tank and to the pump house, office, etc., as desired. The copper float, at A, is fastened to a rod, B, to which are attached the plates C, with an insulating strip between them. The clamp and the hole in the tank act as guides to hold the rod in a vertical position. When the tank is full the lighting circuit is closed by bridging the space at the contacts D and E, lighting the white globe. When low water is indicated, the space at F and G is bridged, and the red globe is lighted.—James E. Noble, Toronto, Can.



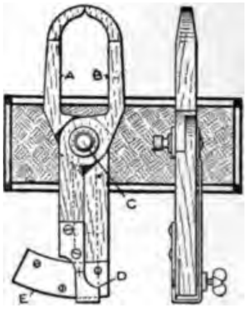
Device for Tapping Small Machine Parts

A machine which was found useful in tapping quantities of small parts is made as follows: Turn off one side of each of three 5-in. grooved pulleys, at an angle of 45°, making cone-shaped wheels. Remove the chuck from a breast drill, and thread one end of a ¾ by 12-in. shaft to fit it. Upon this shaft mount two of the pulleys, 4 in. apart, facing each other, and equally distant from the center. A second shaft, at right angles to the first, takes the third bevel pulley at one end, the pulleys being faced with leather. The leather is drawn tightly over the shellacked face of each pulley, bound down at the back with wire, and later trimmed off. A wooden frame of 2 by 4-in. stock forms the support of the two shafts, which run in pillow blocks. The shaft carrying the friction wheel is belted to the source of power and runs continuously, while the chuck shaft runs ahead when pushed in, and reverses when pulled in the opposite direction. The speed should be about 200 to 250 revolutions per minute.—Dexter W. Allis, Whitman, Mass.



A Caliper with Locking Scale

Mechanics who have had experience with calipers will readily perceive the advantages of the indicating feature of this homemade caliper. I made this instrument of wood for gauging the top and back of a violin in course of construction, and it has many other uses. The legs A and B are fitted together at the lap joint C with a washer, and secured with a screw and knurled nut. The movable arm D is made of sheet metal, and is swung from the bolt that secures the legs, the thumbscrew locking the arm of the scale E. The latter is a piece of sheet metal fastened to the leg A, and its extension, with screws. A pointer is also fastened to leg B. When the caliper is completed, the pointer D is locked against arm A, and the indicating marks scribed deeply on the pointers. A scale may also be marked on the part E. Ordinarily arm D is clamped on E, as desi [illegible] opening gauged by th [illegible] William A. Robins [illegible] Pennsylvania.



Repairing Small Tire-Tube Punctures

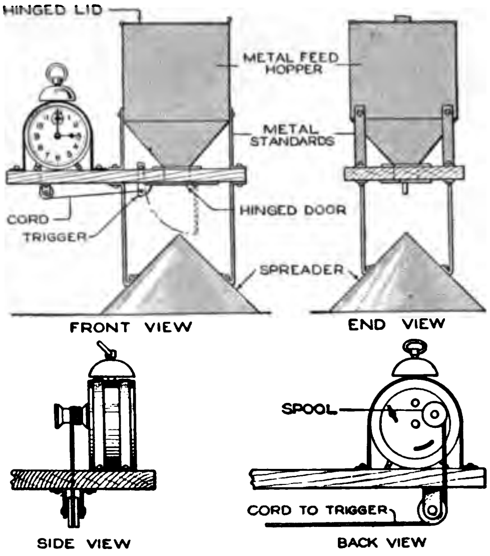
Many automobile-tire repairmen, in repairing a pinhole puncture, use a patch several times as large as the injury. This requires very heavy pressure to obtain a smooth surface. A better way is to trim the hole just enough to remove all ragged edges. Clean it thoroughly and apply cement. When the cement has dried, force a small thread of gum through the hole with an awl, trimming it flush on the outside. In curing, use just enough pressure to hold the tube firmly on the tube plate; tracing cloth laid on the plate insures a smooth surface.

Automatic Poultry Feeder with Clock Control

Uniform quantities of feed may be fed to poultry with a minimum of attention by the person caring for them, if the simple arrangement shown in the illustration is installed in the poultry house or yard. The grain or other feed is placed in the metal hopper, the device being supported on the rafters or other suitable support. The hinged door at the bottom of the hopper is controlled by a trigger, connected to the clock alarm winder by a cord. When the alarm is released, the cord is wound on a spool fixed on the alarm winder, and the trigger is freed. The feed falls to the conical spreader, and is scattered to the ground.

The hopper may be made in various sizes, and several may be rigged with the same clock control. It is mounted on a ⅞ by 9 by 18-in. board, on one end of which the clock is fastened, by a strap of iron. The spreader is supported from the board by metal rods. The hole in the bottom of the hopper is 2 in. in diameter, and the spreader is 12 in. wide.

A spool is secured to the alarm winder of the clock and the cord controlling th [illegible] is wound on it. [illegible] alarm [illegible] the and releasing the trigger, and feed. The fowls soon become accustomed to the ringing of the alarm, and respond to it quickly.—C. C. Holmes, Detroit, Michigan.

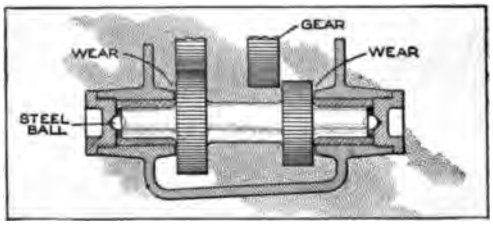


The Poultry Feed is Scattered on the Ground from the Suspended Hopper and Spreader, When the Alarm Mechanism Releases the Trigger

---

Ball Bearings Overcome Thrust in Gear Shaft

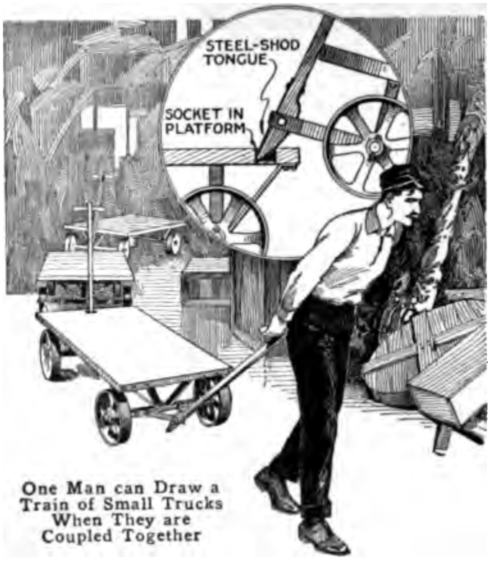
The countershaft in the gear box of a motorboat power plant was subjected to a great end thrust when the gears were engaged. This caused considerable wear on the gear box, as indicated. Hardened steel balls were placed at each end of the countershaft, slightly countersunk holes being provided in both the shaft and the housing. They took up the thrust in both directions, eliminating the wear.



Steel Balls Set in Conical Bearings Take Up the End Thrust

Handle Forms Coupler for Train of Trucks

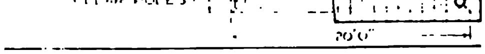
By arranging the tongues of shop trucks so that they may be set in sockets on the rear of similar trucks, forming a train, one man can handle a number of them when empty. The end of the tongue and the socket are protected by metal fittings.—J. J. O'Brien, Buffalo, N. Y.



One Man can Draw a Train of Small Trucks When They are Coupled Together

An Adjustable Hay Shed

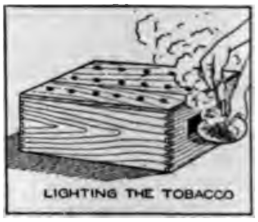
As a protection for hay stacked in the field, the hay shed shown in the illustration proved effective. It was built by setting four heavy cedar poles in concrete at the four corners of the stack and then constructing a roof to slide up and down on the poles. A desirable location for the haystack from year to year was determined upon, and the shelter built at that place. Holes were bored 2 ft. apart in the supporting poles, and the roof is set at various heights by means of bolts placed in the holes. The roof is of comparatively light construction so that it is not difficult to raise or lower it. The tops of the poles are guyed together by means of wire braces.—W. E. Frudden, Charles City, Iowa.



The Roof is Raised and Lowered by Sliding It on the Poles, in Which Heavy Supporting Bolts are Inserted

Fumigating Plants with Tobacco Smoke

The accumulation of insects or scale on plants should be held in check by fumigating them at intervals. An efficient means of overcoming the pests is by the smoke of tobacco. A suitable arrangement whereby this can be done either in the house or outside, is shown in the sketch. Bore 1-in. holes in the top of the box, and cut an opening in the end to admit a saucer. Make a cloth bag to be slipped over the box and tied closely, inclosing the plants, which are set on the box, above the holes. Light the tobacco on a saucer, and put the latter through the opening, so that the smoke may rise around the inclosed plants. The bag is carefully taken out of doors to remove the smoke remaining in it. A light fumigating performed twice is better than fumigating heavily, with possible injury to the plants.—F. H. Sweet, Waynesboro, Va.



Paper Drinking Cups as Containers for Wood-Finishing Materials

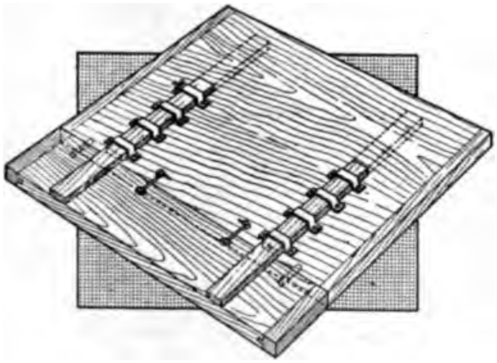
In a shop where many kinds of stains, paints, etc., are used, considerable time and material are wasted in cleaning bottles, cups, or other containers. A satisfactory solution of this problem is the use of paper drinking cups. They cost less than one-half cent each, and may be thrown away after being used once, or used several times for the same kind of stain.—P. Gaffney, Chicago, Ill.

Leather Covering for Auto Magneto Coupling

In an automobile, a small leather covering over the coupling connecting the magneto to the engine is desirable. The dirt and grit will in this manner be prevented from working into the parts of the coupling. The boot is made of thin flexible leather, formed in the shape of a tube, and clamped to the two shafts by means of soft-iron wire.

Extension for Drafting Board

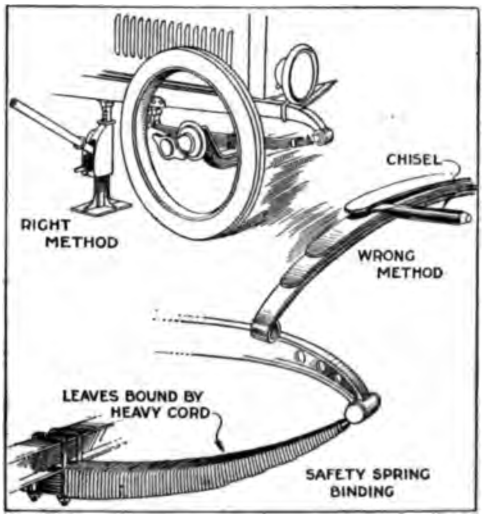
A drawing board of considerable size was found too small for drawings which were to be made from time to time, and an extension was built, which could be removed quickly. The wood used was the same as that in the board, and the ends were fitted with cleats, to prevent warping, and to provide a good edge for the T-square. Metal straps hold the sliding pieces under the board. The extension is held rigid by two deep dowels, set in the joined edges. Hooks hold it firmly against the edge of the board. When not in use, the sliding strips are kept under the board.—Ralph W. Sherman, Burlington, N. J.



The Sliding Strips are Fastened on the Lower Side of the Board, and the Hooks Hold the Extension in Place

Proper Care of Automobile Springs

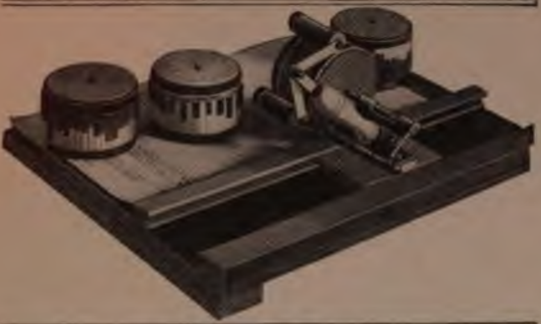
A practical illustration of the care of automobile leaf springs is that frequently employed on racing cars, the springs being wrapped with heavy cords to crowd the faces of the leaves firmly together, increasing the frictional contact, as shown in the sketch. Mechanics, with a hammer and cold chisel or crowbar, sometimes pry apart the leaves of the springs to lubricate them. This method often produces permanent sets or bends. The correct method of separating the leaves is by releasing the clips and staybolts, and placing a jack between the frame and floor to raise the load. Beeswax, or this and powdered resin, heated, is suitable for the springs, if applied as suggested. The unsightly sagging rear of many cars is often caused by failure to maintain proper contact between the leaves, and in some instances by abuse through methods of lubrication. To insert a lubricant, such as oil, between them, may cause distortion and frequently broken springs.



The Leaves should be Properly Released, and Not Pried Apart with a Cold Chisel

¶A strip of canvas glued in several layers to the flanged driving pulley of a motorcycle overcomes the slipping of the belt.

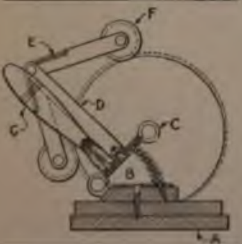
List-Printing Machine for Use with Rubber Type



This Printing Device was Made for Duplicating Lists of Names, and Has Other Uses

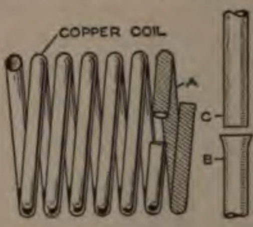
It was found difficult to print a long list of names by the use of the flat type board ordinarily used with rubber type, and, since many copies were to be made, the machine shown was devised. It requires a comparatively small ink pad, and the rollers for the type can be used for many forms of this kind of printing. The rollers were spaced on their circumferences so that the lines of type registered properly in the forms to be printed, which were ruled. Ordinarily it will be necessary to space the type lines at standard spacings, or at spacings determined upon for special reasons. The type may be glued directly to the rollers, or to paper strips, which are then mounted on the rollers. The type rollers are inked by felt-covered ink rollers mounted in a hinged metal angle. The printing device is carried on a sliding block, fitted into a groove on the baseboard.

The detailed construction of the printing device is shown in the sketch. A is the sliding piece which engages the grooves of the baseboard. One butt hinge, B, and half of another, are fastened with screws. The half hinge carries the shaft C, which is the pin of the hinge. A strip, D, holds the angle E, carrying the ink rollers F. They are held at proper pressure on the type by the spring at E, and are kept from dropping between the rows of type by small flanges at their ends, bearing on the wooden edge of the type rollers.



The printing roller is set firmly on the shaft. The first printing line is indicated on the side of the roller, as a guide in starting the impression, the roller being "spotted" by the fingers of the right hand, which holds the handle. The handle G is pushed forward, and the additional sheets are fed against the guide strip with the left hand. The coil spring holds the printing roller off the paper on the return stroke, and tends also to make the impressions more nearly uniform on the forward stroke. —T. T. Sturgeon, Los Angeles, Calif.

Repairing Leaky Copper Heater Coils



Leaky or burned-out copper water-heating coils, such as are used in most water tanks, can be repaired either by brazing a small hole, or, in case of large leaks, a new piece can be inserted. The burned-out part is sawed off, as at A, the shading indicating the burned-out section. Discarded coils from which good parts may still be cut, are used in repairing. One of the ends to be joined is spread with the round head of a machinist's hammer, as at B. The other end C is set into the funnel-shaped part, and, backed with asbestos sheeting, is put under the blowtorch flame. At white heat, using plenty of borax, the spelter is introduced about the joint, fluxing with the copper. At the same instant, the flame must be shut off, to avoid melting the copper coil. Heater coils repaired in this manner are nearly as good as new.—Ralph W. Tillotson, Erie, Pa.

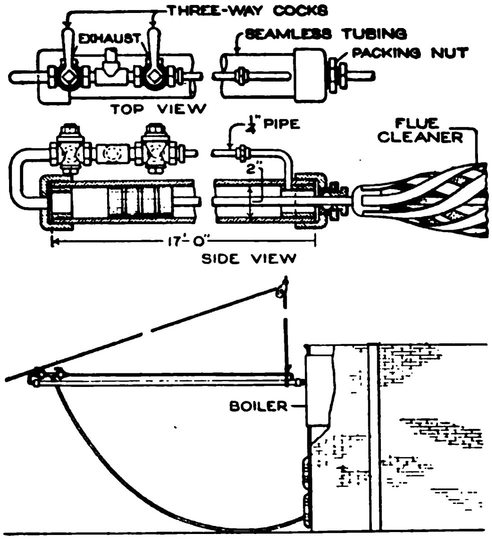
Keeping Down Dust on Concrete Floors

Mopping of some types of concrete floors is objectionable because the water is retained for a considerable time, causing dampness. In other instances the floor wears off, producing a disagreeable dust. By cleaning the floor thoroughly, and painting it with several coats of boiled linseed oil, allowing plenty of time for them to dry, the surface becomes filled. It wears to a smooth polish and the floor may be kept clear of dust easily, by mopping it.

Steam-Operated Flue Cleaner

A handy labor-saving device was rigged up by a fireman in a local boiler room, the details of which are given in the sketch. The boiler it is used on is 16 ft. long, with 56 flues 3½ in. in diameter, and it is quite a job to scrape the flues twice a week with the usual scraper. To make this steam-operated flue scraper, he used 2-in. seamless steel tubing, cut 17 ft. long. On each end he fitted a cap, and a packing nut on the forward end. Next he molded a piston of babbitt metal, 3 in. long, cutting grooves for two rings taken from a small motorcycle engine. A hole was then tapped at each end of the 17-ft. tubing for the steam pipes. A piece of ½-in. pipe was attached at the back end, with a suitable fixture to fasten to a steam hose. Two three-way lever cocks were attached as shown, and ¼-in. pipe run from the lever cocks to the forward end. A ½-in. pipe was used as a piston rod, to which the scraper was fixed.

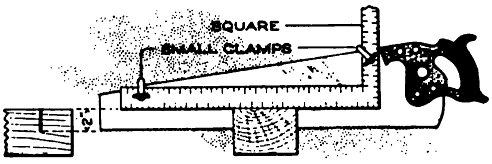
In use, a rope is fastened to the end bearing the scraper, as shown, and run through a small pulley fastened to the ceiling. The scraper is started in the tube, and then the operator simply holds against the cylinder and opens the end cock, permitting the steam to drive the scraper through the flue. Then he opens the same cock to the exhaust position, and at the same time turns steam into the cylinder through the other cock, which forces the scraper back. By means of the rope and pulley, all flues are quickly reached. The device is used at from 40 to 90-lb. pressure, as the firemen find convenient.—R. S. Matzen, Fort Collins, Colo.



Anyone Who has Pushed a Tight Scraper through Boiler Flues will Appreciate the Labor Saved by This Device

Depth Gauge on a Hand Saw

In making the saw cuts for joints in timber, much time can be saved, and the job made more nearly uniform, by using a depth gauge on the hand saw. A simple contrivance for this purpose is made by clamping a steel square on the side of the saw, as shown. By adjusting the square properly, cuts may be made which are deeper on one side than on the other. When this kink was used by a carpenter recently, his fellow workmen immediately followed suit by rigging up devices in imitation of it.—J. V. Romig, Allentown, Pa.

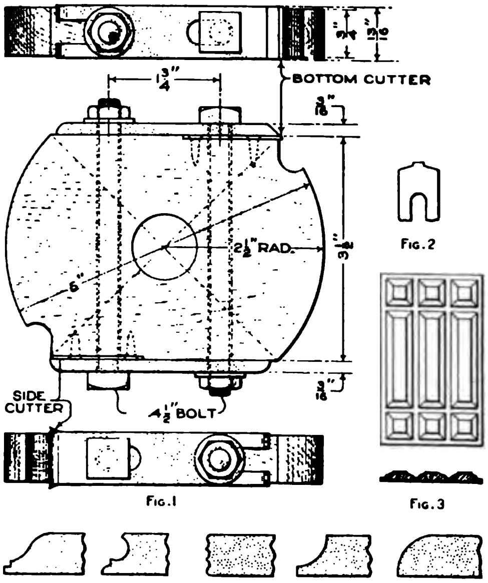


The Depth of Saw Cuts is Gauged Accurately by the Use of This Simple Device

A Molding Head for the Circular Saw

By CHARLES A. KING

THE modern circular-saw table, with its tilting top, its ripping, cutting-off, and mitering devices, and its movable throat, is an almost indispensable tool, but its possibilities either are not realized or are ignored in many smaller woodworking shops. A variety of jigs and attachments for the circular-saw table may be made which will greatly broaden its range of usefulness. The head herein described, if accurately made, with knives properly shaped, tempered, and balanced, will be found efficient for many purposes.



The Molding Head Is a Useful Addition to the Circular Saw Table, Especially in the Small Shop

The low cost of making a head of this sort, compared with the cost of the patented heads upon the market, will permit several of them to be made and kept on hand for special work; they are especially valuable in small shops, where there are no machines but a circular-saw table.

In making the head, select a well seasoned piece of maple, or other very hard wood, a little less in thickness than the width of the knife it is expected to carry, and cut it to a circle a little larger than the desired dimensions, about 5 in. Bore a hole in the center of this circle, to fit the spindle of the saw arbor. The roughly shaped head may then be placed upon the spindle and the collars set tightly up against its side. A rest for a turning tool should be devised, and, after starting the machine, the edge may be turned until the head is of the desired size.

Remove the head from the spindle and draw diagonals, as shown in Fig. 1, at angles of 45° with the direction of the grain, and indicate the portions to be cut off at the upper and lower edges. Cut away the segments, and straighten the edges until they are parallel with each other and square with the sides of the head.

Locate upon each side of the center, and 1¾ in. apart, the centers for two ⅜-in. holes, which pass through the head at right angles with the direction of the grain of the wood. These must be placed at exactly the same distance from the center, and bored carefully from each side until the holes meet. Cut out places for chip clearance, as shown, making the cut at right angles with the straight surfaces.

Fit a 5/16-in. bolt of proper length into each hole, and place a washer and nut on it. The head should now be put in place and the machine started up to see if the head runs smoothly. Usually there will be no trouble, but if the head jumps it should be balanced by boring small holes in the wood upon the heavy side until it runs with little or no vibration. If the bare head runs as it should, but vibrates when the cutters are in place, it will be known that the trouble is with them.

The cutters may be ground, or forged, from regular sizes of tool-steel blanks, as indicated in the sketch, but if such are not available, heavy worn-out files may be used. The knives should be slotted to permit endwise adjustment.

If it is desired to make a grooving head, the straight cutter should be 1/16 in. narrower than the width of the desired groove; the other, being the lip, or scratcher knife, should project slightly beyond the edge of the straight knife, to perform the same function as the lips of an auger bit, which enter the wood ahead of the cutters, to prevent the latter from tearing the grain of the wood.

The points of the lips may be swaged so that only their ends will come in contact with the wood, as friction of the wood against the back of their edges may injure the temper. The form of the bottom cutter may be varied within a wide range of designs, suited to other work than cutting grooves. For instance, one shaped like Fig. 2, used with a lip cutter, will make a good design for a checkered panel, like Fig. 3; or the panel may be carried diagonally over the knives, making diamond-shaped checks, and by using different-shaped knives, the head may be adapted to a number of decorative and constructive uses. If a groove narrower than the thickness of the head is to be cut, the knives will have to be made long enough to cut the depth of the groove before the head reaches the surface of the wood.

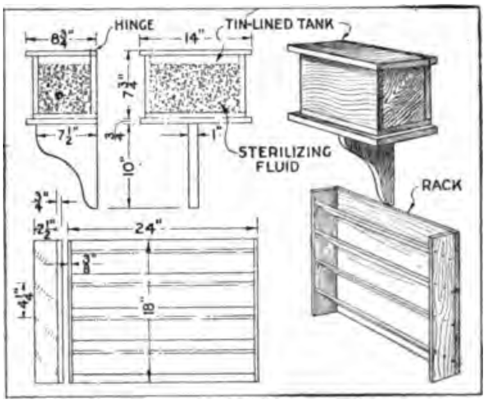
Knives may be made in pairs, for molding the edges of shelves, for panel moldings, surface moldings, quarter-rounds, and scotias, as indicated in Fig. 4. One essential in the fitting of each pair is that they balance perfectly, as otherwise it will be impossible to make even fairly smooth work.

The head described is ¾ in. thick, but it may be made as thick as the distance between the collars upon the spindle will permit, and in some cases, the knives may project beyond the sides of the head.

A head of this type, 5 in. wide, if fitted with slotted adjustable knives, will make a satisfactory jointer or molding head, which can be used in many ways. An arrangement of springs, or pressure bars, may be devised which will hold the wood firmly against the knives and reduce the vibration of the wood to a minimum, besides giving added safety to the operator.

Rack and Case for Sterilizing Shop Goggles

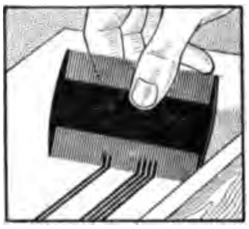
In a shop where the workmen were required to wear safety goggles at various times, a number of pairs were provided for general use. For hygienic reasons these were sterilized before being used again. A tin-lined tank, mounted on a bracket support, contained the sterilizing fluid, and the goggles, after being removed from the fluid, were placed on a rack, made of ⅜-in. wood, as shown.—B. A. Donley, Renovo, Pa.



This Sterilizing Tank and Rack were Provided for the Care of Shop Goggles for General Use

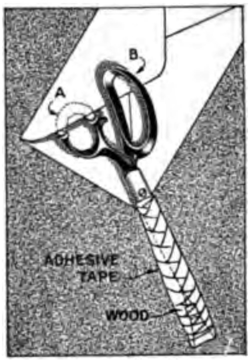
Comb Used as Ruling Pen

In an emergency a fine-toothed comb will serve as a ruling pen for drawing two or more parallel lines at one operation. Five-lined music scores, cross-section and profile papers, borders for drawings, and various classes of decorative designs can be made with this device. Bevel slightly the edges of the teeth in contact with the paper, to give straighter edges to the lines. The teeth on one side of the comb, cut down to half length, afford a multiple stylus for making carbon copies.—H. L. Wiley, Portland, Ore.



Pair of Scissors Used as Envelope Sealer

A useful envelope sealer was made in an emergency, when a large number of envelopes were to be sealed. In an old pair of scissors a small piece of wood was inserted between the blades, as indicated, and the blades bound with electric tape. A string was wound around the top of one of the handles A. The string was moistened and inserted under the right end of the flap, and drawn along, the handle B pressing down the flap and sealing it.—Wilfred Reeves, Toronto, Can.



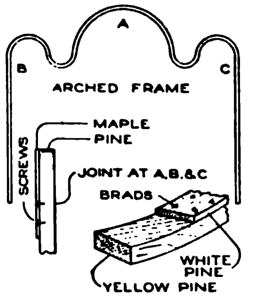
Tray for Storing Mica Washers without Damage

Mica washers become ruined quickly if kept loosely in a box, or other container, and the tray shown in the sketch was made to care for an assortment of them. The box is 5 by 8 by 10 in. in inside measurements. The washers are placed on dowel rods, mounted in a ⅞-in. board that is fitted loosely into the box. A long screw hook was fastened at the center of this board so that the assortment may be removed quickly, using the screw eye as a handle.—L. M. Drake, Daytona, Fla.

¶Water made slightly acid with muriatic acid will clean and restore the brightness of gold-leaf gilding; this method is used by sign painters.

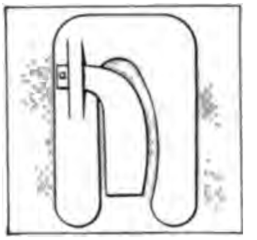
Reinforcing a Light Wooden Triple Arch

I had occasion recently to make a wooden arch for the purpose of decorating with miniature incandescent bulbs. The arch, shaped as shown, was 7 ft. from B to C, with curves of 1¼ by 2-in. material. The standards were of white pine, but the arch itself was of yellow pine, a wood that is somewhat brittle. I secured a lot of thin wood from orange crates, and glued it on the curves with its grain across the yellow pine. Brads were used to hold the strips. To facilitate handling in transportation I divided the arch at A, B, and C. The parts were joined with pieces of maple, secured with screws. This method of strengthening the arch was so effective that I carried it, in a bundle of four sections, a distance of 17 miles on the trolley car and erected it without a split developing.—James M. Kane, Doylestown, Pa.



Erasing Shield Adjustable to Various Lines

The advantage of this erasing shield, which I made for my own use in the drafting room, is that it is adjustable to many shapes of lines, even in intricate drawings. It may be made of thin sheet metal, preferably aluminum, or of celluloid. The central piece is slipped through openings cut in the main portion and is prevented from falling out by a small knob, pressed into the surface at the end.—W. K. Creson, Newcastle, Ind.

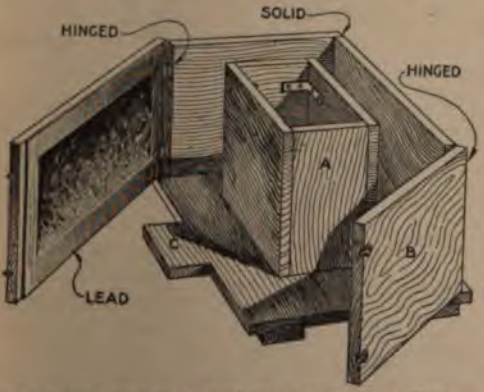


Bracing a Long Droplight Gas Fixture

On a long gas pipe, extending vertically from the ceiling, a brace was found necessary. It was provided by building up a right angle of lighter pipe and fitting it to the main pipe, so that the brace joined it about 4 ft. from the ceiling and extended vertically about 1 ft. from the main pipe. It was fastened to the ceiling with a pipe flange.—M. K. James, Chicago, Ill.

Lead Form Varies Face of Concrete Blocks

In a homemade wooden form for making concrete blocks of the hollow type, used on porch and column foundations, the faces of the blocks were varied by making the corresponding side of the form a frame with a lead panel. The form was built up in the usual way, of 7/8-in. wood. The core A was braced with angles, and the outer form B was hinged at two of the corners. The corner at which it opens was provided with catches. The lead face was made of a sheet of lead, 1/8 in. thick. It was hammered into various forms, each block, or group of several blocks, being made slightly different. The cast block is set aside to dry on the base C. A block 8 by 10 by 12 in., with walls 2½ in. thick, is suitable for porch columns.—Fred Quantmeyer, River Vale, N. J.



The Lead Panel is Shaped so as to Produce Various Faces on the Concrete Blocks

Nonwarping Frying Plate for Electric Stove

An electric stove was provided, when purchased, with an aluminum pan, as shown at A. The first time it was used for hot cakes it warped diagonally across the middle, as at B. This made cooking with it very slow, and to straighten it so it would not warp seemed impossible.

The Cast-Iron Hearth of a Stove Proved to Be Better than an Aluminum Pan and a Sheet-Iron Plate for Making Hot Cakes

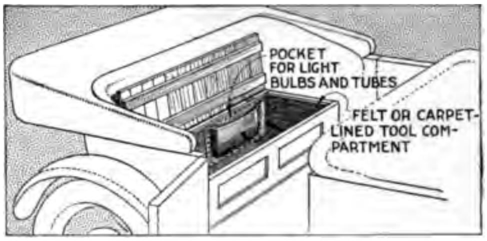
A piece of No. 20 gauge sheet iron was cut a little larger than the stove, and used as a plate. However, it warped, as at C. The hearth of a discarded wood cookstove was then used. The sides, as shown at D, were sawed off, leaving a cast-iron plate, 1/8 in. thick. The edges were filed straight and smooth and the top smoothed as much as possible. This plate did not warp and has given satisfaction, as indicated at E.—C. F. J. Charliss, Houston, Tex.

Directions Painted on Machine Save Cleaning

The floor around the spot where a lever shear was located in a sheet-metal shop, was frequently littered with cuttings. A box was provided for them, but little used. A sign "Put Cuttings in Box," painted in white letters on the lever of the machine, furnished the necessary constant reminder. Thereafter the floor was clean, and the expense of gathering up the scrap was eliminated

Padded Compartments in Auto for Small Equipment

Tool compartments, under the seats, in automobiles are usually of rough

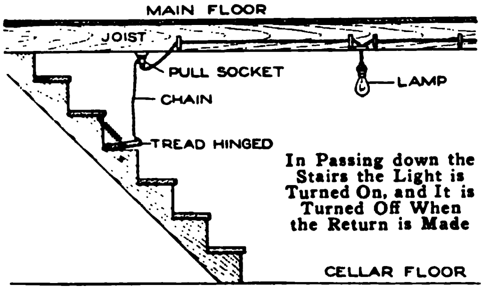

POCKET FOR LIGHT BULBS AND TUBES
FELT OR CARPET-LINED TOOL COMPARTMENT

A Lining in the Tool Compartment Protects the Contents and Overcomes the Annoyance of Rattling

wood or sheet-iron construction, which exposes their contents, such as curtains, top cover, inner tubes, spark plugs, electric bulbs, tools, and other equipment, to the damaging effect of jostling over the roadways. If a lining of felt, canvas, or carpet is provided, it eliminates this to some extent, and overcomes the annoying rattle of the loose parts. It is a good plan to provide separate compartments in one side for storing inner tubes and electric bulbs.

For those who carry an emergency can of gasoline or oil, a similar covering will protect the container. A convenient foot rest is provided where the emergency can is padded, and then strongly covered.

Electric Switch Controlled by Hinged Stair Tread

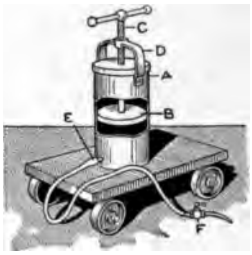


In Passing down the Stairs the Light is Turned On, and It is Turned Off When the Return is Made

Electric lights in the cellar, or attic, are often left burning by accident, but by arranging the light to be turned out automatically when a person leaves the place, no special attention need be given to the light. In the use of such a scheme for a cellar, as shown, a pull socket was fixed to the joist above the stairway. The socket chain was adjusted carefully and fastened to the edge of a hinged tread, kept slightly raised by a spring. Pressure on the tread controls the light socket.—Albert Bourget, Lauzon, Que., Canada.

Large Grease Gun for Garage or Shop

In a shop or garage the ordinary grease gun is often inefficient, because of its small capacity. A portable machine that I made holds 15 lb., sufficient for a large number of cars. The work is also done very quickly with the device, which is mounted on a truck. It was made as follows: An old engine cylinder, A, and piston, B, were fitted with a ¾-in. rod, 14 in. long, C, threaded as shown. A handle was fixed to it, and the yoke D, threaded to engage the rod, was bolted to the cylinder. An outlet was fitted with ½-in. hose, E, and a valve, F, with a nozzle. The nozzle should be long enough to reach the machine parts to be greased, and is made of ⅛-in. pipe. To use the gun, fill the cylinder, screw the piston down tightly and open the valve to the feed desired. —M. R. Landin, Denver, Colo.



Care of Chamois-Skin Wash Leather

So-called chamois skin, or wash leather, should be wrung out at once after using it in water. Spread the leather out carefully, and hang it up to dry. Hot water makes it harsh. Wash the leather in soapsuds, using a good white soap, and permit some of the suds to remain in it. If properly cared for, a wash leather, used considerably, is better than a new one.

The Making of an Eye Magnet

By JOHN D. ADAMS

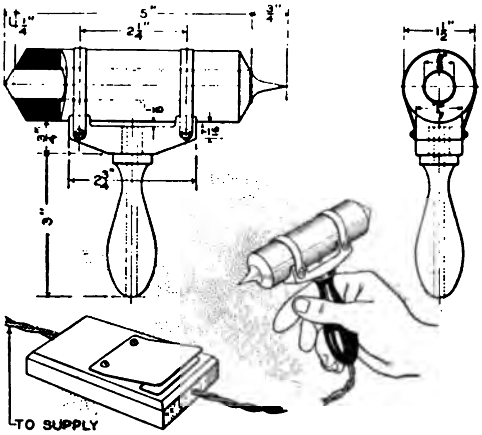
When one considers the number of accidents to the eye that occur in machine shops and factories from flying chips of iron and steel, it is remarkable that the eye-magnet method of extracting is not more commonly used. It is the purpose of this article, therefore, to describe the construction of a strong eye magnet that may be connected up directly, without any additional resistance, to the ordinary 110-volt alternating-current supply. The device may be made at a cost of about $1.50 for materials.

The sketch shows the essential dimensions. A stiff paper tube is first formed by wrapping a strip of strong paper, about 18 in. long, on a round smooth rod, about 5/8 in. in diameter.

The core is composed of soft-iron wires, neatly packed together and temporarily wrapped with wire near each end to hold them together. Dip the ends in soldering fluid and then in a small pot of melted solder, in which they should be held until the solder works well in among the wires. Before unwrapping, file off the ends, one to a dull point and the other quite sharp.

The temporary core upon which the tube was formed is then mounted on the bench in a pair of blocks, so that it may be turned readily with an improvised crank fastened on the end. The tube is then forced on tightly, after which the winding is begun. This preliminary work will save time, as it is impractical to wind wire by hand, and winding in a lathe is often unavailable for amateurs. Secure the end of the wire to the mandrel; about 1½ lb. of No. 20 wire will be necessary. Wind on the first layer tightly and shellac it. In beginning the second layer pull the wire tightly, and then wind it in the hollows of the first layer. By continuing this method the ends of the coil will build up at an angle of 60 degrees.

To mount the coil, a wooden yoke should be prepared and fitted to match the curve of the coil. In the center of this, a wooden handle, having a central hole large enough for the usual flexible cord, is fitted and glued into place. A pair of brass or copper bands are fitted and drilled at each end. Run the flexible cord up through the handle and connect it to the coil, soldering the two joints, after which place the bands in position and tighten the screws.



A Powerful Eye Magnet may be Made at a Cost of $1.50 for Materials, and Is Useful in Shops Where There Is Danger from Flying Chips

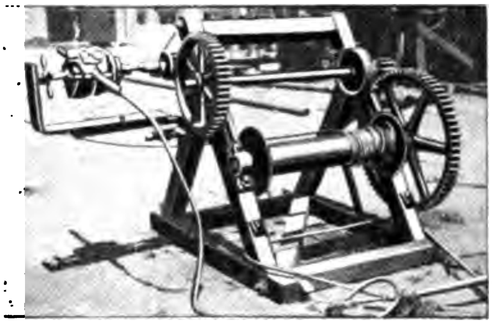
The floor switch is a block of hardwood, 1 by 3 by 4 in., hollowed out underneath. The spring is made of a wide strip of brass or heavy tin, which is screwed down at one end while the other stands about 1/8 in. above the block. The lower contact is a strip of the same metal, about ½ in. wide and screwed down directly below.

Angle Strengthens Loose Auto Fender

The connection between the fender and running board on an automobile became loose, and caused considerable racket, and in addition the fender became badly distorted. An angle of 1/8-in. sheet steel was riveted below the break. It served as a rigid connection, and was scarcely visible, also making possible the continued use of the old fender.

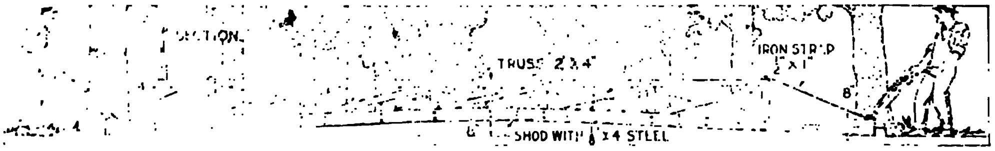
Compressed-Air Motor Drill Operates Windlass

In repairing a 500-ft. well, a portion of the casing was dropped to the bottom. Two men were required to turn the crank of a windlass alternately while "fishing" operations for recovery of the section were in progress. The use of the air motor of a drill, as shown, greatly reduced the cost of labor and the time required. The air-motor drill was clamped to the windlass with U-clamps and angle irons. A socket wrench was tapered and slipped into the drill holder. The wrench was put in place over the square end of the windlass crank, operating the windlass at a moderate speed. The air motor may be used similarly for other winding or shaft-driving operations.—C. E. Eurit, Indianapolis, Ind.


A Socket Wrench was Gripped in the Air-Motor Drill and Set on the Windlass Shaft

Strike Board for Tamping and Crowning Roadway

A combined template and tamper, used in the laying of a one-course concrete pavement, is shown in the illustration. The street being only 37 ft. from curb to curb, the concrete was placed across the entire width as each batch came from the mixer. The template conformed to the 8-in. crown, and was constructed of 2 by 12-in. planks, joined to make the implement the required length. Two such sections were bolted together, and the bottom shod with ⅛ by 4-in. steel. A system of trussing supports the template, and a set of plow handles is fitted at each end. This device was handled by two men throughout the entire job of 102,800 square feet.—A. C. Francis, San Diego, Calif.



The Concrete was Tamped and the Pavement Crowned in One Operation by the Use of This Strike Board

Double Ventilator Hood Draws Fumes Away Quickly

If a ventilator over a stove, furnace, or for similar uses, is made with a double hood, the fumes are drawn away more quickly because of the increased draft. The hood is formed like an inverted funnel having a smaller cone of sheet metal fitted inside of it, the lower edges of both being on a level. The inner cone has a small opening at the top, and a space of about 6 in. is allowed between the outer and inner hoods. The draft through this outer ring is considerably increased.—B. J. Ryan, Buffalo, N. Y.

Sawdust Foundation Levels Floor Linoleum

Occasionally it is desired to lay linoleum on floors, that, by the warping of the boards, have acquired ridges which would be hard on the linoleum. Instead of ruining a plane, and perhaps ruffling one's temper, by attempting to plane down a painted or hardwood surface, it is better to put about ½ in. of fine sawdust on the floor, leveling it off with a straightedge and laying the linoleum over it. The sawdust makes the floor level and adds to the resiliency of the linoleum.

Miniature Landscape Built Up of Concrete

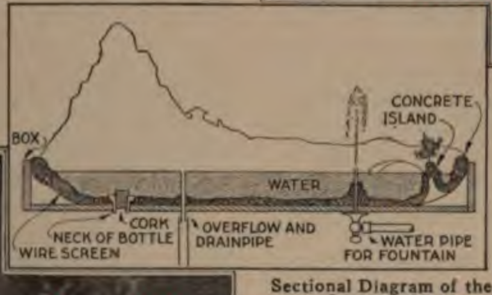
By A. J. VIKEN

AN interesting use of concrete is in the making of models of landscapes, for practical uses as well as for pastime or in scientific work. One of the widest applications of this form of model construction is for display and advertising purposes, where small lakes and picturesque natural effects are desired. The photographs show a miniature landscape which I made principally of reinforced concrete. It measures 20 by 30 in. and is built in a box 5 in. deep. The trees are Japanese air plants. The log cabin is built of matches and toothpicks. Window wire screen was used for fences and bridge railings. In the lake are gold fish, a submarine, a rowboat, and a ship. The lower photograph shows the size of the log cabin and people compared with a match and a 16-size watch.

The Match and Watch Give a Basis for Comparison with the Cabin

The mountain and hills, as shown in the sectional diagram, were built on a skeleton of iron wire, and wire screen, to make the landscape as light as possible. The bottom of the lake was also formed with the aid of wire screen and the concrete put on top of it. After the concrete had dried, the whole landscape was painted in natural colors. The bottom of the lake was given two coats of dark-gray paint, and when thoroughly dry, a coat of paraffin wax was added to make it waterproof, and to prevent the paint from affecting the water. The whole landscape is mounted on a stand like a rectangular mission table.

General View of the Rugged Mountain Lake



Sectional Diagram of the Construction

An Artist's Palette Supported by the Easel

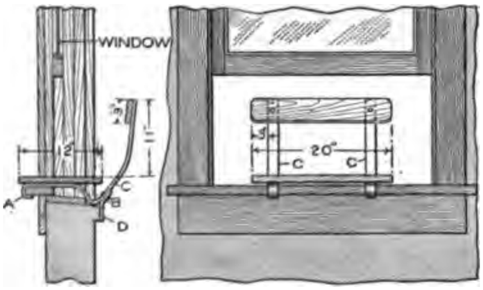
Artists and others who sketch out of doors can make good use of a palette which hooks to the easel and is supported by a stick, as shown. The shelf keeps within easy access the several articles of a painter's outfit, while he is working. It eliminates some of the distractions of outdoor work. The hand is free from holding the usual thumbhole palette, a comfort appreciated especially in hot or cold weather, and in mosquito-infested regions.

The Artist can Work More Freely When His Materials are Kept on the Palette Shelf, Making a Thumb Palette Unnecessary

The palette consists of shellacked canvas tacked on a wood stretcher. Hooks on the easel and screw eyes on the palette provide a support. The brace is inserted in a slot, and held by a large screw eye.—Phil Bierdemann, Chicago, Ill.

A Safety Window-Cleaning Seat

In the home, and in many shops or buildings where window washers are not employed and the usual safety devices are not used, a small window-cleaning seat is practical as a safety measure. One like that shown can be made easily by the home mechanic. It hooks over the window stool, at A, and rests on the sill, at B. The main supports C are of 1/4 by 1½-in. band iron, shaped as shown, and riveted to a seat of wood, 12 by 20 in., and braced at the top with a wooden rest, 3 by 20 in. The safety strips D are of ⅛-in. band iron, riveted to the pieces C. The position of these strips should be determined carefully for the windows on which the seat is used. The back rest makes the work of window cleaning easier.



SECTION ELEVATION

This Homemade Seat Is Comfortable for Window Washing and Insures Reasonable Safety

Hints on the Making and Use of Coil Springs

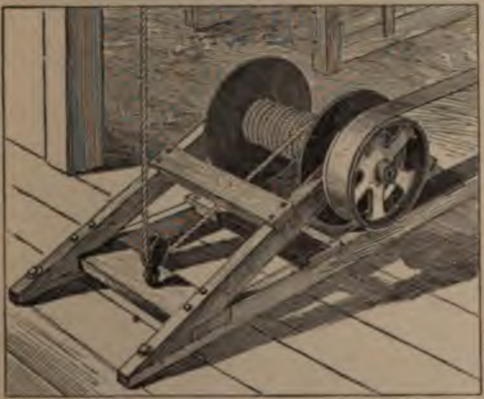
The experimenter or mechanic often spends time trying out springs that could not possibly do the work expected of them, owing to a lack of knowledge on this important subject. First as to coil springs: Compression springs have open coils and the pressure on each end is toward the center. Tension springs have their coils wound close together; the working pressure on their ends is away from the center. A compression spring of greater strength is made by increasing the size of the wire; making fewer coils per inch of length, or decreasing the outside diameter of the coils.

When this kind of spring is compressed, its outside diameter is slightly increased. Where a spring fits in a hole, this should be allowed for. A given weight will compress a long spring more than a short spring, otherwise of the same dimensions. In building a mechanism with a spring that is to be compressed, see that in the extreme closed position there is room left for the spring itself.

A stronger tension spring is made by increasing the size of the wire, or by decreasing the outside diameter of the coils; and a weaker one by changes in the opposite direction. A compression spring of fair quality may be made from a tension spring by spreading the coils with a screwdriver. The loop on the end of a tension spring can be made, with pliers, from the end of the spring wire. Springs may be coiled from spring wire, brass or steel, or from piano wire. Spring wire comes annealed or tempered; if the former is used, the spring has to be tempered after coiling.—Donald A. Hampson, Middletown, N. Y.

Homemade Power Hoist for Loading Hay in Barn

Having a gasoline engine for use on the farm, I rigged it up to aid in loading hay into the barn, by building a hoist for it. An ordinary hay carrier, or fork, was used, with the same tackle commonly used with a team in hoisting the hay into the mow. I built a frame of 2 by 4 and 2 by 6-in. lumber, bolting it together strongly, as shown. The check reel from a corn planter was mounted in it as a drum. On the end of the center shaft a drive pulley was mounted and belted to the engine, which was set in the barn on its usual skid. The clutch for checking the hoisting of the load quickly was on the engine. The arrangement proved more dependable than horses and made it unnecessary to unhitch the team, or to use an extra team for the hoisting.—Ralph A. Page, Urbana, Ill.



This Hoisting Arrangement was Devised on the Farm for Use with an Engine, in Putting Hay into the Mow

¶A worn broom can be used handily for cleaning corners by cutting it to a sharp point at one side.

Warning Horn at Sidewalk Garage Door

A garage, situated on a much-traveled street, uses an effective scheme to warn pedestrians on the sidewalks when a car is about to leave the garage. A circular hole was cut in a sheet-metal pane set in one of the sections of a window at the doorway, and a large electric automobile horn was set into it. The mechanism of the horn is supported on a bracket, fixed to the wall. When a car is ready to leave, the employe, who opens the sliding door, touches a push button, sounding the horn. Passers-by "wake up" without fail at the blast, whereas the car horns, sounded inside, cannot be heard readily outside.—John Miller Bonbright, Philadelphia, Pa.

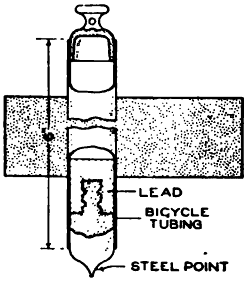
The Warning Horn Set in the Metal Window Pane Is Effective in Safeguarding Pedestrians

Cementing Gaps around Machinery Tension Keys

There are usually unsightly gaps around tension keys used to hold together sections of large flywheels, and other heavy machinery parts. If this space is filled with neat cement, a smooth, workmanlike finish is obtained that will not crack nor crumble. After painting it the same color as the machinery, the joint is hardly discernible. The cement can be chipped out when desired.—H. P. Roy, Kansas City, Mo.

A Drop Plumb Bob of Weighted Tubing

A plumb bob which may be dropped so that its point will indicate a "plumb spot" is handy as a part of the equipment of a home tool chest. An easy way to make a plumb bob of this type is as follows: Cut a piece of 3/4-in. bicycle tubing 6 in. long. Turn a piece of steel to fit the bore of the tube and point it for the bottom of the bob. Turn the other end of this plug with several grooves around it, so that when the lead is poured into the tube with a point in place, the grooves are filled with lead. Pour in about 3 oz. of lead, holding the tube perfectly vertical. Turn a metal plug, as shown, for the upper end of the tube. Secure it by a rivet through the tube. It is best to make this plug so that it can be removed and the plumb line knotted through a vertical hole.—J. H. Beebee, Rochester, N. Y.



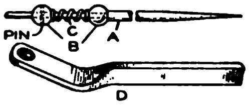
Shelf for Order Books on Auto Dash

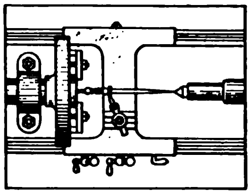
A shelf, made from 5/8-in. surfaced stock, painted to match the dash of a delivery, or collector's, automobile, makes an excellent place for order books and the like. The books are always in convenient position; they cannot easily be bounced out of the car and lost, nor thrown on the floor and walked on, becoming soiled and dog-eared. The shelf is set across the dash at an angle, so that the books lie nearly vertical, in a slotlike rest.—Francis W. Nunen-
Berkeley, Calif.

Indicator for Centering Faceplate Work

Some means for accurately locating the center of faceplate work in the lathe is a great convenience to machinists or tool makers. An effective device for this purpose is shown in the sketch. The rod A is of 1/8-in. cold-rolled steel, 12 in. long. One end is turned to 3/32 in., for a length of 1 3/4 in., and pointed to an included angle of 60°. The other end is filed to a sharp point, and both ends are casehardened. Two 5/16-in. bearing balls, B, are annealed, and drilled 3/32 in. to fit the end. The spring C is made from .020 music wire 5/8 in. long, and wound on a 3/32-in. core. The inner ball is free to slide, while the outer one is fastened to the rod with a pin, the spring separating them.

The stock D, for holding the testing bar, is used in a tool holder, and is made of 5/16-in. square cold-rolled steel. A 7/32-in. hole is drilled and chamfered in the flattened end. The view of the lathe as seen from above shows the tester in use. The stock is fastened in the tool holder, the bar A is pushed through the 7/32-in. hole in the flattened end, and the carriage advanced until the 60° end of the bar is in contact with the job. This pushes the loose ball against the spring and holds the end against the work. By starting the lathe and observing the relation of the pointed end to the tailstock center, it is easy to determine how much the piece is off center.—William E. Jewett, Jersey City, N. J.





LATHE FROM ABOVE

¶Time may be saved in drafting I-beams, and other duplicate parts, by making a triangle having special angles, or a hole in it, for marking these standard shapes.

Structural-Steel Sliding Base for Motors and Machinery

By A. L. FENTON

A STRUCTURAL-STEEL sliding sub-base is often convenient for belt-drive electric motors and machinery, and may be arranged substantially as shown in the photograph and detailed in the sketches. These sub-bases are desirable especially where the service is severe, and the belt requires frequent tightening. Provision is usually made on the bases of belt-drive motors to permit take-up for belt tightening, but in some cases the adjustment provided by the manufacturer of the motor is not sufficient. Where a sub-base of the type shown is used, the base can be made long enough so that any reasonable amount of take-up will be provided.

The structural-steel members of the base are I-beams, held together with plates, riveted to their lower flanges, as detailed in Figs. 1 and 2. Holes for the anchor bolts are provided in the plates. Channels may be used instead of I-beams with a decrease in cost, but an I-beam has two flanges as against one for a channel, and hence is capable of being riveted more securely to the plates, and held more rigidly upon the top of the foundation where it is to be installed.

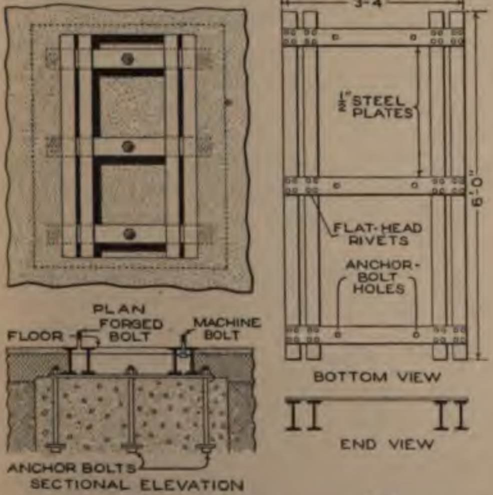


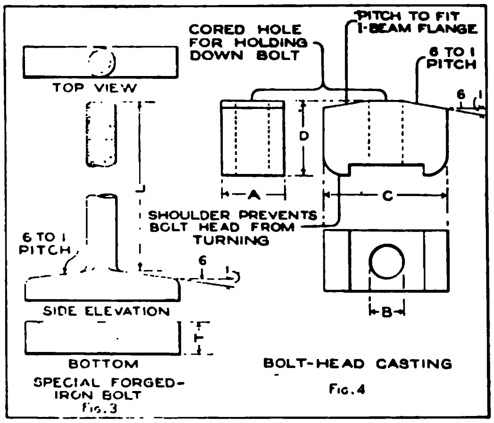
FIG. 1 FIG. 2

The Frame is Built Up of I-Beams to Which Steel Plates are Riveted

In installing the structural-steel sub-base, it is mounted on top of the foundation prepared for the motor, as shown in Fig. 1. The height of the foundation should be such that the top faces of the I-beam members will, after the sub-base has been installed, lie flush with the face of the top floor. The surfacing of the floor should be built up close to the sub-base, as indicated in the sectional elevation.

A Substantial Foundation for Motors and Machinery Which Permits of Easy Adjustment or Removal of the Machines

The motor base is bolted to the sub-base by means of bolts set in the slot between the pairs of I-beams, as shown in two forms in Fig. 1. The bolts for this purpose are made as detailed in Fig. 3, or ordinary machine bolts can be used in combination with a casting similar to that shown in Fig. 4. The casting is shaped to fit the I-beam flange, and the head of the bolt is held in a recess, preventing the bolt from turning. The T-bolt is forged by welding a piece of stock of suitable dimensions to the head end of an ordinary machine bolt. The under side of the T-head should be given a 6 to 1 pitch to correspond with the pitch on the flanges of the I-beam, or channel members, in the sub-base, against which it is clamped. The thickness T of the head should be such that the bolt can be dropped into the slot between the I-beam members of the sub-base, so that if a bolt breaks, a new one can be substituted, and so that it will not be necessary to place the bolts in the sub-base until all of the rough work involved in building the foundation and setting the sub-base has been completed. The length L of the bolt will be determined by the thickness of the motor base, and by the general proportions of the particular installation.



A Forged Bolt with a T-Head, or a Machine Bolt, may be Used to Secure the Machine Bases

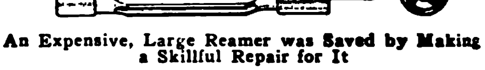
Where a bolt-head casting, like that of Fig. 4, is to be made, its thickness, A, should always be such that the casting can be inserted in the slot between the I-beams in the sub-base. Hence, these I-beams must be spaced a little farther apart than the thickness T of the head of the forged bolt. The diameter B of the hole should be just large enough to produce a good sliding fit on the bolt. The length C should be about twice the thickness, and the height D proportioned as shown.

Filing Down a Thin Washer

It is difficult to hold a thin washer in a vise while filing it on the face, and a good method of accomplishing this is to file the washer flat on the bench, or on a block. Drive a nail into the bench top, or into a block, so that its head is just below the surface of the washer, and place the latter over it. Lay the file flat across the washer, a little to one side of the center. File with a forward stroke only, causing the washer to turn slowly. An even cut will be removed from all parts of the surface.—Walter B. Raynor, Patchogue, N. Y.

Repairing a Large Reamer

An apprentice drove the expansion screw of an expensive, large hand reamer in too far, causing the reamer to crack, as indicated at A. A satisfactory repair was made by first removing the pin B, separating the shank D and the body. The screw C was then taken out, and a tight push-fit collar, E, was forced on the blades, to hold down the broken ones. The reamer was put on centers in the lathe, and the groove F was ground in. The portion between the new groove and the old one at G was ground down to a diameter slightly smaller than before. A steel bushing, H, was made, the hole in it being .003 to .004 in. smaller than the newly ground part at G. The bushing was heated and shrunk on the reamer, the old groove beside it being made as wide as the original one, at A. The bushing held down the broken blades, and was ground down to the size of the shank D. The reamer was then reassembled.—Richard H. Jehlicka, Worcester, Massachusetts.



An Expensive, Large Reamer was Saved by Making a Skillful Repair for It

---

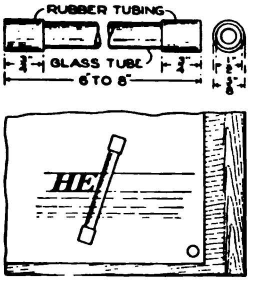
ℭA machine bolt is usually screwed down 2½ times its diameter.

Shop Bin Economizes Short Lengths of Steel

It is customary in some machine shops to discard short lengths of cold-rolled and machine steel into a box provided for this purpose, and when a sufficient quantity has accumulated to sell it as junk. This frequently results in the throwing away of useful pieces. Particularly when steel is high-priced, care should be exercised to cut down material costs. An economical plan is to provide two bins, one for cold-rolled steel, for the screw-machine operators, etc., and one for the machinery steel. These bins are divided into compartments, 9 in. square and about 3 ft. deep, and their size and number depend on sizes used in the plant. Each compartment is for one size of steel, ranging in length from 6 in. to 3 ft., the smaller lengths only being thrown away as scrap. Time is also saved in finding short lengths for various small jobs.—Joseph Plogmann, Cincinnati, Ohio.

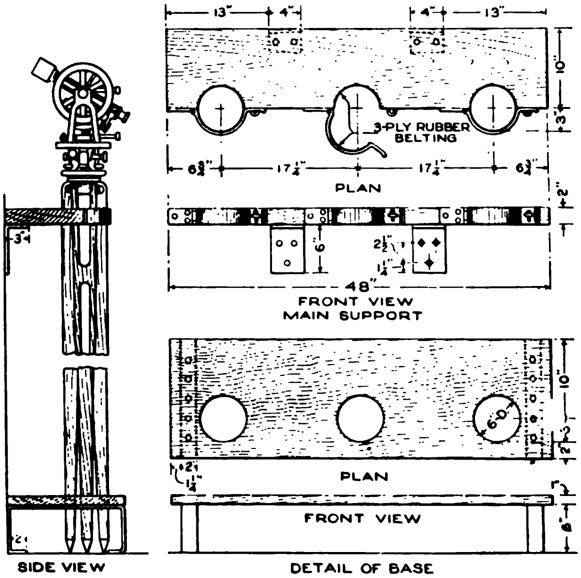
Glass Rod Used as Parallel Ruler

A useful drafting-room tool is a parallel ruler made from a piece of glass tubing or rod, 6 to 8 in. long and about ½ in. in diameter, and two short sections of rubber tubing of a size to fit snugly on the ends of the tubing or rod. The rubber ends keep the glass part off the tracing, enabling the ruler to be used over wet ink. The ruler is especially useful in large lettering. It is steadied with the left hand, and rolled to a new position carefully so as not to change its direction.—R. L. Templin, Champaign, Ill.



Rack Safeguards Surveyor's Instruments

After a floor sweeper had overturned a surveyor's transit set in a corner of an office, causing $35 damages, a rack was designed for it and two other instruments. The top portion serves as a holder for the upper part of the instrument, and the lower fixture keeps the tripod legs from spreading, as detailed.



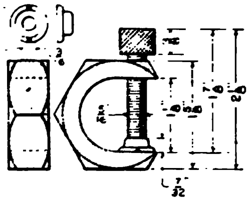
The Expense of Making This Rack was Found a Small Premium on the Assured Safety of Valuable Instruments

In placing the instrument in the holder, the legs are first folded together and placed in the lower fixture. The hinged piece of the upper holder is swung out, the instrument set in place, and the hinged piece closed, and padlocked, if desired.—Roy H. Poston, Flat River, Mo.

Bushing in Handle of Soldering Iron

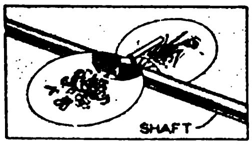
The constant heating and using of soldering irons causes the handle to become loose, making it difficult to do close work. In this case, remove the handle and insert a bushing of heavy tin, where the shank enters the wood This holds the handle firmly, and ke it from burning.—Stanley Radcl Laurel, Md.

Machine Clamps Made from Hexagon Nuts



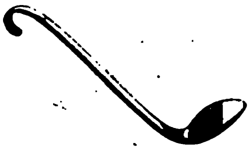
I made a set of hexagon clamps which are strong and useful for many kinds of small work, by fitting 1-in. cold-pressed nuts with thumbscrews, as shown in the sketch. One side of the nut is cut away and a $\frac{5}{16}$-in. knurled thumbscrew, provided with an adjustable cap at its lower end, is fitted to it, as shown. These clamps may be laid flat on work and can be used like parallel clamps in many cases.—J. Harger, Honolulu, Hawaiian Islands.

Fans on Machine Shafting Cool Workman



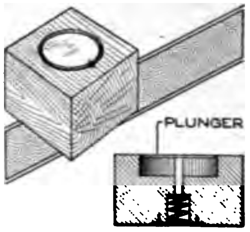
Lacking an electric, or other common power fan, an ingenious workman in a machine shop attached two ordinary paper hand fans to the line shafting, securing them with cord, as shown. The result was a rather unique fan, which cooled him at his machine, nearly as well as the boss's elegant brass fan cooled him, in his private office.—M. J. Doyle, Cleveland, O.

Skimmer for Removing Slag from Molten Metal



In using molten lead or other metal, especially in the workshop where it is gathered in many small pieces, it is important that the slag be skimmed off carefully. A handy tool for this purpose was made by hammering a piece of iron rod out to the shape shown in the sketch, the small end serving as a handle, and the rounded edge of the skimming end fitting against the curve of the ladle in which the metal is melted.—E. K. Marshall, Oak Park, Ill.

Device for Wrapping Small Articles of Uniform Size



A block for wrapping small articles, such as typewriter ribbons, in tin foil, can be made from wood with metal fittings, as indicated. The hole in the top is cut $\frac{1}{16}$ in. larger than the width of the article to be wrapped. The foil is laid on the top of the block, then the article is pressed down, and the foil drawn from the sides and pressed with the palms of the hand. When released the article rises above the top, so that it can be handled easily. Articles wrapped in this form are neater and more uniform than when wrapped by hand. The shape of the hole in the block can be varied to suit special needs.—A. H. Hale, Brooklyn, N. Y.

Reaming a Bushing or Collar without Reamer

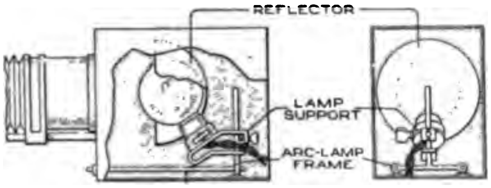
To enlarge a bushing properly, where a reamer is not obtainable, take a round rod, or a piece of wood, somewhat smaller than the bushing; wrap emery cloth around the rod and place one end in a vise. Place the bushing over the emery cloth. By coiling a cord twice around the bushing, and pulling on the ends of the cord, first one, then the other, the bushing is dressed to a perfect fit. In reaming a bushing by this method, for piston pins, etc., it should be made to fit rather loosely, because of the tendency to tighten when in place.—J. W. Reynolds, Mason, Ill.

Saving Overall Buttons That Pull Through

The buttons used on mechanics' overalls and jumpers sometimes pull out. Examine the buttons used; if in the center two bent wires hold on the button, they can be sewed on again. With a pair of cutting pliers cut off the rivet head of the button that pulled through the cloth; remove the wires from the center of the button, and it may then be sewed on. If it is the type of button that shows a round rivet-head center, it cannot be so used again. Keeping these buttons saves hunting up other suitable ones.—John Hoeck, Alameda, Calif.

Incandescent Lamps Used in Stereopticon Lanterns

The electric arc lamp has been used to a great extent in stereopticons and moving-picture apparatus, where an intense light is essential. However, the newer high-candlepower incandescent nitrogen lamp, from 300 to 1,000 watts, provides a satisfactory substitute for the arc lamp. The former requires little attention, and is more economical of current. It is also safer than the arc lamp, and is easily adapted to stereopticon equipment.



SIDE VIEW END VIEW

The High-Power Nitrogen Filament Lamp Is Safe and Efficient for Use in Stereopticon Lanterns

A special support of ⅛-in. sheet iron is provided for the arc lamp, as shown, and is clamped on the vertical rod. A 300-watt lamp is satisfactory for small stereopticons, and the 500-watt size for larger ones. Round-bulb lamps are used, and a reflector, placed behind the lamp, increases the light efficiency. The old housing and lamps are used. —E. A. Binney, St. Louis, Mo.

Valve and Stand for Inflating Tires Quickly

Much time is spent in inflating tires in automobile factories and garages, and the device described reduces this operation to a minimum. The tire is inflated after it has been placed on the rim, and before the latter is placed on the wheel. A stand is used, as shown in Fig. 1, and a special valve is arranged on the tire-inflating fixture. This is shown in the detail sketch. The weight of the tire and rim presses down the plunger, which bears, at its lower end, on a ball and a spring, controlling the air at the inlet. The air passes around the spring and the ball and up into the tire valve. A pressure gauge and a shut-off valve are provided in the air line, so that the air may be regulated easily.—William J. Outcalt, Detroit, Mich.

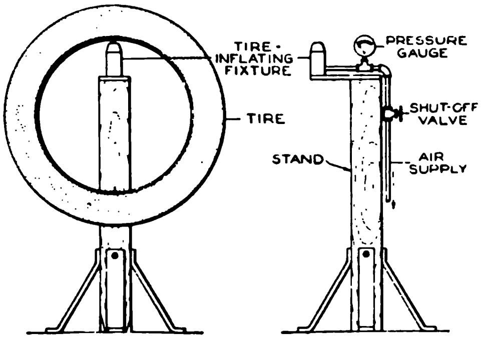
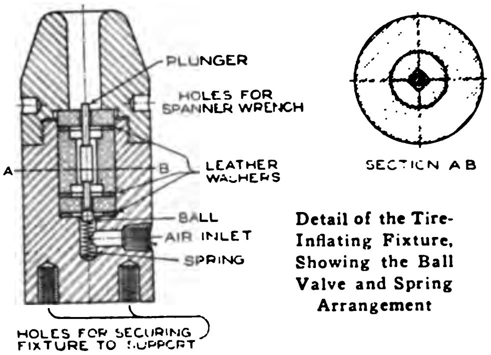


Fig. 1

The Tire is Inflated After It is Mounted on the Rim, and Before the Rim is Placed on the Wheel



Detail of the Tire-Inflating Fixture, Showing the Ball Valve and Spring Arrangement

---

ℭA piece of tin, fixed to the lower edge of an ax handle at the head, saves we

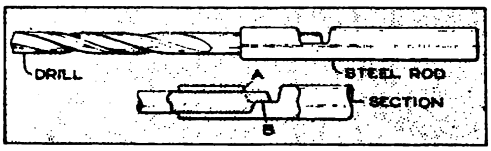
Barrel Sprinkler for Oiling Roadway

In summer, the suburbanite is often confronted with dusty driveways and walks that are easily improved with a homemade oil sprinkler, like that shown. A steel frame, mounted on wheels, was rigged up to hold an ordinary oil barrel. Inserted in the bung is a short piece of pipe equipped with a shut-off. To this is attached the sprinkling pipe, having perforations, about 1½ in. apart, of sufficient size to allow the oil to flow freely. The cart may be drawn, or pushed, the latter being more convenient, discarded shoes being worn, and a thin layer only applied.—J. C. Grindell, St. Louis, Mo.

Occasional Oiling of Roadways with a Homemade Sprinkler will Keep Down Dust around the Home

A Solderless Extension Drill Rod

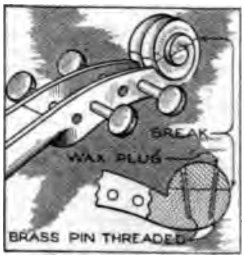
In using an extension drill, a common practice is to sweat the shank of the drill into a brass tube, or a rod bored out. This process fixes the drill more or less permanently in the rod or tube, requires special heating for the soldering. By making a special drill rod with a simple chuck arrangement, as detailed in the sketch, it is unnecessary to solder the drill into place. The end of the drill rod is bored out to receive the drill, and a groove, A, is filed across the rod and into the drilled hole. This provides a small, slightly beveled shoulder, B, which grips a corresponding shoulder on the end of the drill. The fastening is very strong if carefully made, and the drill can be quickly removed.—V. Arkin, Chicago, Illinois.



The Drill is Held in the Extension Rod by the Shoulder Joint

Hidden Screw Rivets for Woodwork

When one has done a fine bit of gluing, as on the neck of a violin, some not unsightly reinforcement is often desirable. I proceeded in the following manner in making such a repair: Using No. 17 brass escutcheon pins of a suitable length, I cut off the heads, and gripped the pins in the chuck of a small hand drill, and threaded them. Taking another light hand drill, and with a drill about two sizes smaller than the pin, I bored through the glued parts as many holes as were necessary. I cut off the point of the pin, and, with it still in the hand drill, screwed it into the hole. To hide the screw pins, I cut them off on the top side and dressed it smooth. Carefully pricking a center mark, and taking a drill the size of the brass wire, I drilled out a little of the end. By waxing these holes and staining the spots properly I had a strong and neat job.—L. M. Drake, Daytona, Fla.



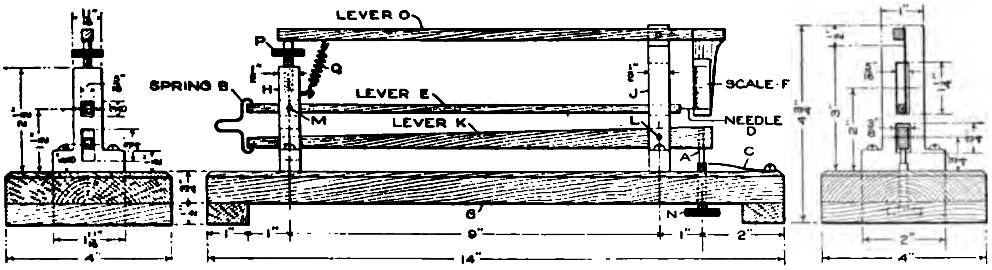
- -- - -

ℭA bearing for moderate speeds and light duties should be of a length at least two diameters of the shafting. High-speed shafts should have bearings of a length four times the diameter of the shaft.

A Direct-Reading Lever Micrometer

By H. L. WILEY

THICKNESSES of paper, sheet metals, rubber and cloth fabrics, wire, and similar materials, can be read directly to .0001 in. with this lever micrometer. It can be operated much more rapidly than a screw micrometer of the usual type, over 30 readings per minute being possible after a few minutes' practice. To operate the micrometer, the anvil A is raised by placing the finger lightly upon the spring link B, the object to be measured being guided to its position under the anvil by means of the guide spring C. When the object is between the jaws of the micrometer, the spring link B is released, and the needle D, at the small end of the lever E, immediately indicates the thickness of the object upon the scale F. Upon the base G are mounted two supports, H and J, through which run the levers K and E. These levers, K and E, work respectively on the pins L and M. The upper anvil A is set into the end of the lever K, and forms a contact with the lower anvil, which is the end of the screw N. The small end of lever K is connected to lever E by means of the spring link B, which is made out of a piece of clock spring, or other thin, flat spring steel. The small end of the lever E terminates in a fine needle, working close to the scale F. This scale is carried on the end of lever O.



END ELEVATION

SIDE ELEVATION

END ELEVATION

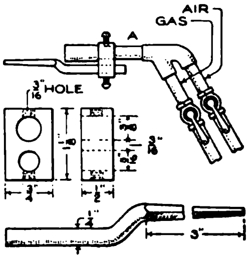
When the Operator becomes Accustomed to This Homemade Lever Micrometer, He can Read to Minute Accuracy with It

Base, supports, and levers are made of cedar, or other light-weight wood, as the machine is delicate in its action, and superfluous weight in the moving parts, especially in lever E, should be avoided. The levers K and E are carried on fine needles thrust through them at points M and L. The levers work through slots cut in the supports H and J. To keep the levers from touching the sides of the slots in the supports, washers, or fillers of fine glass beads, can be used on both sides of the levers.

The scale F is 1 in. long, graduated to hundredths of an inch. If desirable, a reading glass can be mounted on support J, directly focused upon the scale. With the upper and lower anvil jaws in contact, the reading on the scale should be zero. If such is not the case, adjustment is made by means of the screws N and P. Both of these screws work directly in the wood. In placing them, holes, slightly less in diameter than the screws, are drilled into the support H, at the top of which is located the screw P, and into the base G, through which passes the screw N. The coarse adjustment, by means of which the indicator needle D is brought within .01 in. of the zero line on the lower end of the scale F, is made with the screw N. The finer adjustment is made with the screw P. The lever O is held lightly against the screw P by means of the small coil spring Q.

This machine is accurate, by close observations, to .00001 in. and will stand considerable hard use without requiring adjustment. As soon as the operator becomes accustomed to its use he can read to $\frac{1}{50,000}$ part of an inch without difficulty. The machine will indicate the thickness of a pencil mark on paper.

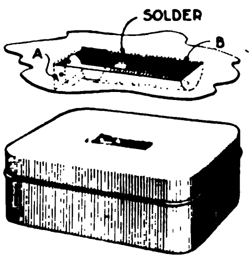
Tool for Soldering Automobile Radiators



An attachment made in the shop to be used with a common gas-and-air torch is the best arrangement for soldering automobile radiators I have ever used. When the leak occurs in the cells of a honeycomb radiator, little difficulty is experienced in soldering it. A tube radiator can also be soldered, without moving the webbing.

The soldering iron is made of ¼-in. round-iron stock, bent as shown in the sketch, ground square and slightly tapering from the curve to the point. The length of the iron depends on the depth of the place to be soldered, 3 in. being practical. The torch unscrews at A, allowing the device to be slipped on through the ⅜-in. hole in the clamp, provided with setscrews.—Charles G. Moon, Des Moines, Ia.

Boxes for Small Hardware Display Contents

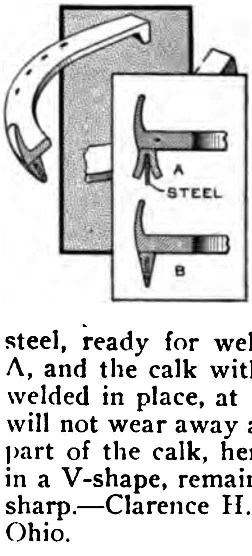


A convenient way to keep nails, screws, and other small parts, is to place them in tin boxes of uniform size, which may be stacked without the use of shelving. It is desirable to mark the boxes so that the contents may be identified easily. A good way to do this is to make a depression in the top or front of the box, large enough for one of the articles contained. The sketch shows how a screw was fastened in the top of the box. The part A was bent to hold the head, and the part B hammered in.—H. K., West Nyack, N. Y.

Washer Holds Bolt from Turning in Clamping Grooves

To keep the head of a bolt from turning in the clamping grooves of a planer, miller, or other shop machine, on which machine parts are bolted down while in process, take a washer of the same size hole as the bolt diameter, and turn over two opposite edges of it so that the head of the bolt fits between them. Then slip the washer under the head of the bolt, so that it rests in the clamping groove, almost as a part of the bolt head. This takes up the looseness.—J. Fast, Denver, Colo.

Preventing Rapid Wear on Horseshoe Calks



An efficient method of fixing a horseshoe calk so it will stay sharp is to have the blacksmith split the toe calk lengthwise and insert a strip of steel cut from a worn-out mowing-machine knife. This is done after the calk is welded to the shoe. The inserted strip of steel, ready for welding, is shown at A, and the calk with the strip of steel welded in place, at B. The hard steel will not wear away as fast as the softer part of the calk, hence the calk wears in a V-shape, remaining comparatively sharp.—Clarence H. Green, Columbus, Ohio.

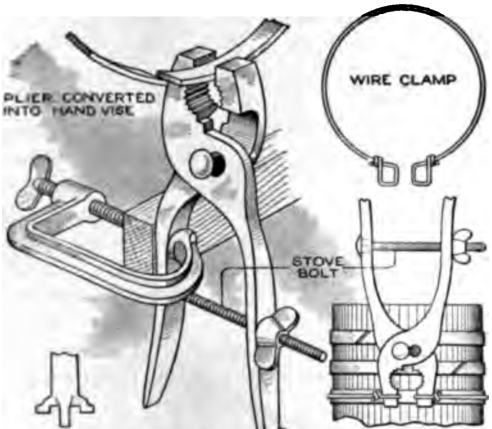
Toothed End Prevents Screwdriver from Slipping

The troublesome slipping of an automatic screwdriver, often experienced when driving is unusually light or hard, can be avoided by filing small teeth in the edge of the blade. About 24 teeth to the inch, or about seven teeth to a medium blade, is suitable, and they should be kept sharp as saw teeth.

Handy Plier Vise Used on Piston Rings

An effective method of securing additional usefulness from an ordinary combination adjustable plier, is to drill two elongated holes through the handles, inserting a 3/16 by 3-in. screw or stove bolt, as shown. A thumb nut controls the adjustment, providing a hand vise that is useful for light work. A C-clamp fastens the plier quickly on an automobile running board, for roadside repairs.

One of the many novel uses to which the vise may be applied is as an aid in a one-man method of inserting pistons in the cylinders of a gas engine. A wire band of the diameter of the piston is made, as shown, with loops at the ends for the nose of the plier. The vise in position, as indicated, compresses the piston ring and holds it clamped until the piston is slid forward into the cylinder. The end of one handle of the plier is forged and filed into a convenient automobile-starting switch key, which cannot easily be mislaid.—George A. Luers, Washington, D. C.


PLIER CONVERTED INTO HAND VISE
WIRE CLAMP
STOVE BOLT
EMERGENCY SWITCH KEY
METHOD OF COMPRESSING PISTON RINGS

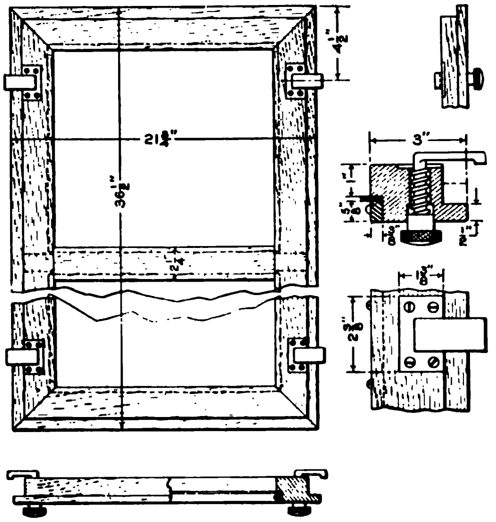
The Automobilist and Mechanic can Make Better Use of a Plier by Applying These Simple Kinks

---

A few drops of oil applied to the joints of a folding rule greatly facilitate its use.

Emergency Sash for Railroad-Car Doors

Window sashes are frequently broken on railroad coaches, and it has been found desirable to have emergency sashes on hand at the repair shops of divisions. The sketch shows the detailed construction of such a sash that can be installed in a few minutes. The glass is held in a wooden frame which is locked in place by means of four catches. The latter are shown in detail in the sketches at the right. The catch consists of a brass fitting, cast with an angle plate at one end and a round rod at right angles to it. The rod is machined and fitted to a plate fixed to the sash. A spring acting against a knurled knob, sliding over the end of the rod, draws the angle end firmly against the window casing.—John W. Shank, Renovo, Pa.



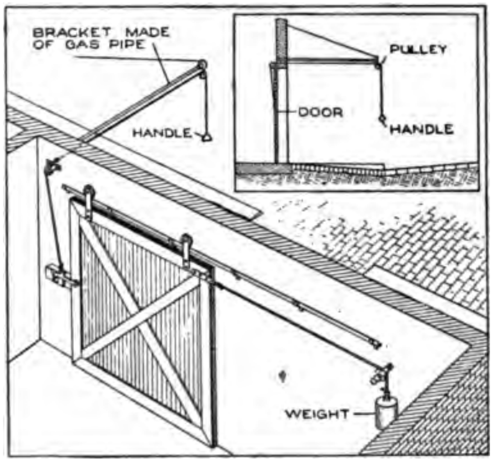
This Emergency Sash was Designed for Use on Railroad Coaches

Boiler-Furnace Stokers' Inspection Glass

A piece of blue glass, about 4 in. square, mounted in a small frame having a handle, is useful for stokers examining the condition of the fires large boiler furnaces, which req close and repeated inspection to ma tain efficiency.

Self-Opening Garage Door

It is often annoying, especially in rainy or winter weather, to get out of an automobile at the garage in order to open the door. Customers at a public garage usually toot their horns until the door is opened, and in order to make this unnecessary I built a self-opening arrangement for the garage door. The auto driver pulls on the handle suspended in front of the door, releasing the door catch. The door is then automatically opened by the counterweight. The garage attendant can easily close the door, and adjust the catch for the next patron. This device is also handy on private garages. A section of gas pipe, braced with strong wire, was used to support the pulley and the unlocking cord.—R. S. Matzen, Fort Collins, Colo.



The Driver of the Car Pulls on the Handle, Releasing the Catch, and the Door Opens Automatically

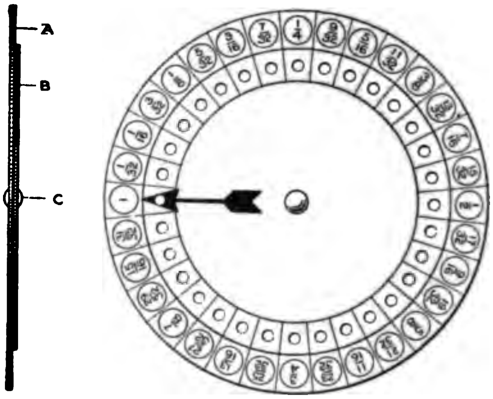
Hammering Tightens Worn Brass Thumb Nuts

When brass thumb nuts used on drawing instruments, and for similar purposes, become worn, they may be tightened by hammering them slightly to make the threaded hole smaller. Place the nut on a metal plate and strike it a level blow with a hammer. Try the nut in its original position, and repeat the hammering until a tight fit results. —E. C. Griess, Grand Forks, N. D.

Shop Device for Addition of Fractions

Draftsmen, machinists, and many other mechanics, will find the homemade instrument shown in the sketch almost indispensable after giving it a trial. A disk, A, of heavy white cardboard or opaque celluloid, is graduated as indicated. A smaller transparent disk of celluloid, with small holes drilled in it to correspond to the graduations on the disk A, is riveted to the latter, at C, permitting the disks to turn. The arrow is scribed on disk B.

To add two fractions, such as $^{5}/_{16}$ and $^{7}/_{32}$, set B so that the arrow is at 1, place a pointed, pencillike stick in the hole in the arrowhead and turn this disk until the arrow is at the fraction $^{5}/_{16}$; then place the stick in the hole now opposite 1, and turn B until the stick is at $^{7}/_{32}$. The arrow will then be at $^{17}/_{32}$, which is the sum of the two fractions. This process may be carried on indefinitely, and each time the arrow passes the unit graduation, 1 is added to the sum. To subtract two fractions the operation is reversed. The arrow is placed at the larger fraction; the stick is placed in the hole opposite the smaller one, and disk B is turned back to 1. The arrow will then be found to point to the difference of the two. Disk A may be graduated to suit the uses for which it is intended, and decimal equivalents to the fractions placed underneath them.—James F. Boyd, Detroit, Mich.



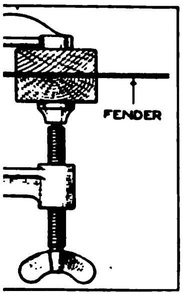
Much Time is Saved and Errors Minimized by the Use of This Handy Adding and Subtracting Device

d and Accurate Repair of Broken Tapeline

hen the only available steel tape-
ɔn a job broke it was necessary to
: a repair immediately. A piece,
t 1 in. long, was broken out and it
replaced and a good joint made
llows: A piece of steel was cut
an old stovepipe, to the same
ı as the tape and 3 in. long. It
marked carefully to correspond to
roken part, and riveted into place
ordinary carpet tacks, cut down to
roper length.—P. A. Midland, New
, N. Y.

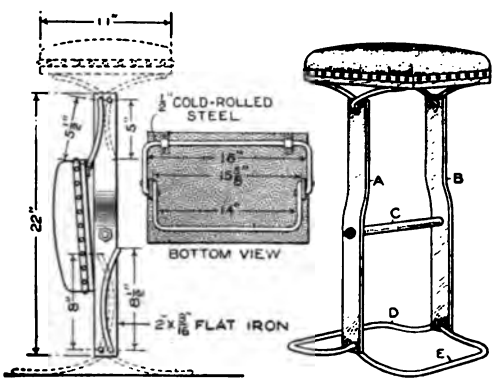
ɔving Dents from Auto Fenders or Sheet Metal

simple and effective means of re-
ng dents from automobile fenders or sheet metal is to clamp the damaged part between two wooden blocks, as shown in the illustration. An iron cabinetmaker's clamp is best suited for this purpose, but various other
s of applying pressure may be
Where the damage is consider-
this method will, of course, re-
the surfaces only partly.—Arthur
iller, Evansville, Ind.



ion-Seat Folding Stool of Metal

is compactly folding stool was
of high-grade materials shaped
ıe use of a forge. If softer metal
ed the parts may be bent cold.
ı iron, $^3/_{16}$ in. thick, was used for
ıieces A and B. The brace C is
t. The pieces D and E are made
ap together, the shoulders on the
of each checking the motion of
ɔther. The upper supports are
similarly of $^5/_{16}$-in. cold-rolled
The rigidity of the stool de-
ȝ on the care with which these parts are made and fitted. The padded top is built up around a wooden frame, one of the upper supports being hinged to it, as shown in the bottom view.

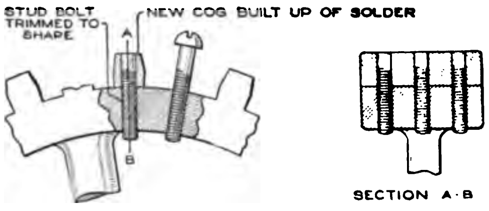


The Upper and Lower Supports Brace Each Other, and the Stool can be Folded Compactly

The method of folding the stool is indicated at the left.—Hubert Kann, Pittsburgh, Pa.

Repairing Broken Teeth in Fiber or Paper Gears

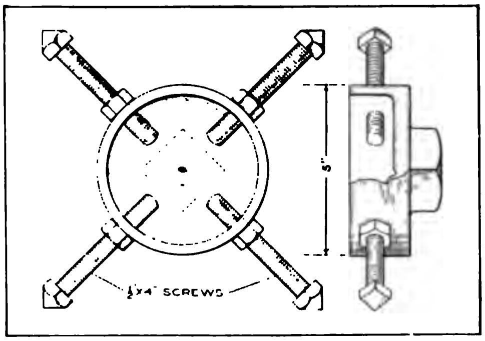
A repair of broken teeth in gear wheels made from fiber or compressed paper, by replacing the broken teeth with lead reinforced by screws, proved satisfactory. The broken tooth stub was dressed down with a file, and holes for machine screws were drilled as indicated in the sectional views. The bolts were given a brushing with soldering acid, and the tooth was built up on them, with solder and a soldering copper. After roughing in the tooth, it was finished with a file. The heads of the bolts were cut off flush with the curved surface of the gear. Such a repair, properly made, will last practically as long as the other teeth.—Logan E. Anderson, Cove, Ore



The Broken Teeth were Replaced by Building Up New Ones of Solder around Machine Screws

Spider for Cutting Large Pipe in Lathe

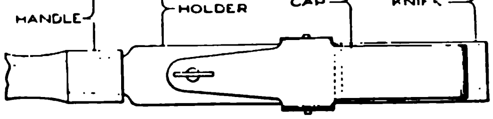
A machinist in our shop, having to turn out a lot of 8-in. pipe for couplings, had no tool large enough to center the pipe in the lathe. He obtained a 5-in. plug and drilled four holes in it, and tapped them out for ½-in. screws, as shown. Taking four ½ by 4-in. machine screws, he ground the heads to a point, leaving just enough to put a wrench on. He fitted four locknuts to the screws, and put them in place. The tool is inserted into the end of the pipe, adjusted, and centered, and the locknuts tightened up. The other end of the pipe fits into the chuck of the lathe.—Charles K. McCluskey, Wheeling, W. Va.



The Work was Turned Out in Record Time with This Tool

Holder for Wood-Turning Tools

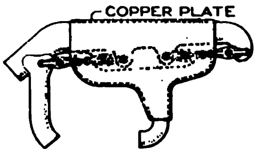
Instead of having handles for each wood-turning tool, a mechanic made a simple holder which makes it necessary to have only a single handle and a number of bits, which are inserted as required. The bits, or knives, are thin, making it easier to grind them to various shapes. The detailed construction of the holder is shown in the sketch. A sheet-metal clamp is pivoted over the main support of the holder and clamps the knife by means of the thumbscrew.—M. E. Duggan, Kenosha, Wisconsin.



This Holder Provides for a Number of Knives or Bits for Wood Turning, with a Single Handle

Copper Covering Transmits Heat to Auto Intake Manifold

A practical means of heating the intake manifold of an automobile from the hot exhaust manifold, to increase the efficiency, is to cover the entire intake manifold, and part of the exhaust manifold, with No. 20 gauge copper, bending well around each, and making it meet in the rear of the intake manifold. This copper plate is held in place by boring holes through it to correspond to the bolts on the engine block, slipping it over these bolts, and then setting the pipe clamps in place, tightening them with the nuts, as usual. The copper plate conducts the heat from the hot exhaust manifold to the intake manifold. After running the engine 10 minutes, the intake manifold becomes so hot that the hand cannot be held safely on it, thus preheating the gas, and making it more combustible.—Charles A. Pettit, Rossville, Md.



Ropes Fed through Floor from Basement Stock Room

Coils of different-sized rope lying around the main floor of a hardware store look untidy, to say nothing of the valuable floor space they occupy and the dust they collect. A good way to do away with this nuisance is to place the coils in the basement on a shelf, bore holes in the floor for the different sizes, and pull the rope through, as required. A single loose knot will prevent the rope from sliding back. A measuring scale is laid out from the hole, the rope being pulled out and measured off in one operation.

Filing Cork in a Lathe

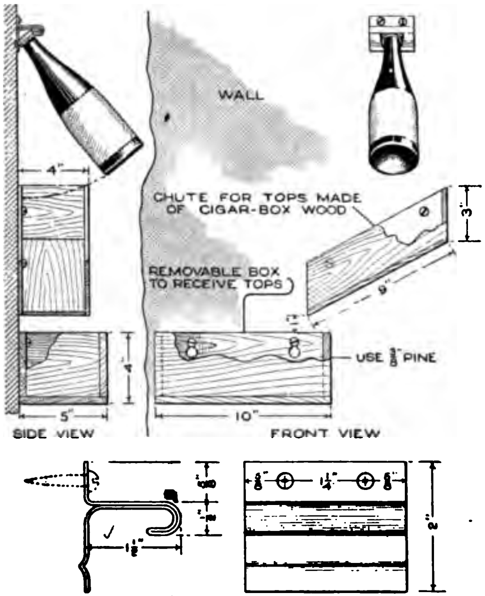
Cork cannot be turned in a lathe in the usual manner, but can be cut down quickly by filing it, much as metal spindles are finished in a speed lathe. A coarse file, preferably of the type used for filing wood, is used for the roughing out. Special care must be taken that the file is applied only on the forward or cutting stroke. If the cork is of a fairly solid texture, it can be worked quite smoothly. To finish the surface, apply a fine file, gradually applying greater pressure. To give the cork a polished surface, burnish it with a smooth piece of steel.

Beveled Piston Ring Overcomes Excess Oil in Cylinders

Many automobile and similar motors have a tendency to pump oil into the compression chamber, which causes rapid accumulation of carbon. I have found the first cylinder usually the worst. After some experimenting I filed off the lower, outer corner of the piston ring at the bottom of the piston, beveling it slightly. The ring was replaced in its normal position, and reduced the pumping of oil. The opening around the corner of the ring prevents the oil from being sucked up into the cylinder. When a piston fitted quite loosely, an oversized piston was substituted with very good results, the lower ring being beveled as described. —J. W. Reynolds, Mason, Ill.

Remover and Wall Receptacle for Bottle Caps

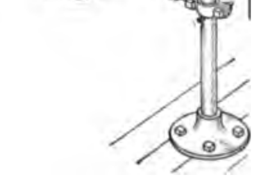
In a store, or other place, where drinks or bottled goods are sold in bottles having metal caps, a convenient way to remove the caps and prevent them from falling on the floor is to install an arrangement like that detailed in the sketch. The caps are removed quickly by means of the small device fastened to the wall, and dropped into a chute and a box made of cigar-box or other thin wood. The box is suspended on screws and can be quickly removed and emptied. The cap remover, as detailed, is made of a strip of galvanized sheet iron, bent over a ½-in. pipe held in a vise. It is fastened with screws.—P. P. Avery, Garfield, New Jersey.


WALL
CHUTE FOR TOPS MADE OF CIGAR-BOX WOOD
REMOVABLE BOX TO RECEIVE TOPS
USE ⅜" PINE
4"
5"
10"
9"
3"
SIDE VIEW
FRONT VIEW
DETAIL OF TOP REMOVER

The Bottle Caps are Quickly Removed and Dropped into the Receptacle, Avoiding the Danger of the Slippery Caps on the Floor

Belt Guard Pivoted for Easy Removal

A belt guard on some machines, while desirable for safety, is considered a necessary evil, especially when it interferes with making quick adjustments of parts of the machine, which it makes inaccessible. A swinging guard that can be moved out of the way in an instant is shown in the sketch. It is supported by a pipe column, which may extend from the floor to the ceiling, if desired.—J. J. O'Brien, Buffalo, N. Y.



Suggestions on the Care of Automobiles and Motorboats

By HAYES BIGELOW

INEXPERIENCED automobile and motorboat owners may find the following suggestions helpful: Almost all nuts, bolts, and screws have right-hand threads. They tighten as the hands of a watch turn, and loosen in the reverse direction. If a nut or bolt fails to turn on applying moderate pressure, remove the wrench, and tap the part firmly, several times, with a hammer. By using wrench and hammer alternately, almost any "frozen" nut or bolt may be started. With slotted screws, tap on the head of the screwdriver with a block. When the screwdriver shaft is square a wrench or pliers used.

The application of oil, or, in some cases, heating the surrounding metal, facilitates the work. Be sure the wrench fits snugly, and does not cause burrs. Left-hand threaded nuts are usually placed on axles, or other bearings, where the motion might tend to remove a right-hand threaded nut. Propeller-shaft stuffing boxes in boats may have left-hand threads. A left-hand thread loosens as a right-hand thread tightens, and vice versa.

Graphite, No. 1 or finer, is often useful. Mixed with oil or grease and applied to threads, it prevents sticking, and is particularly useful in making up pipe joints and union nuts which will be subjected to heat. Candle wicking, rubbed full of grease and graphite, makes a good packing for propeller-shaft stuffing boxes, setting up little friction—a good point to remember when dealing with a hard-starting, two-cycle engine not equipped with a clutch. Plain graphite, thoroughly rubbed over wheel rims, tends to prevent rusting.

Shellac is not dissolved by gasoline. Always use shellac on the threads of gasoline connections. Gasoline-supply tubing sometimes develops leaks suddenly; a cloth soaked in shellac provides a temporary repair when wrapped ›und the leaky pipe. Tire tape will not hold gasoline long unless shellacked. Soap is a fair substitute when shellac is not at hand. Gasoline cuts the oil in white and red lead, and many kinds of varnish.

Storage batteries need distilled water frequently, and lack of water ruins them. Some cells lose water more rapidly than others in the same battery. Sulphuric acid weakens slowly, and should never be introduced into the cells except by an expert. Acid fumes rise from the cells, and if given a chance to work on battery connections, will cause corrosion, which may put a self-starter, operated from the battery, out of commission. All connections should be bright, and assembled with vaseline, which is impervious to acid fumes. Corroded bolts and lead-cased nuts can be cleaned by boiling them in a solution of cooking soda and water. Such connections, if corroded, are likely to stick very tight, and can best be loosened by applying a pair of hot tongs to the nut before attempting to twist it.

If the self-starter operates sluggishly, run it 30 seconds and then feel its battery and line connections. If a connection is warm, its contact is either loose or corroded, and the full current is not able to pass through it. Generator armatures should be clean and not sticky, and the brushes free and smooth.

Blue smoke pouring from the exhaust indicates too much cylinder oil, and this condition produces carbon trouble. Only a stiff, new engine justifies the use of much oil, and even then the smoke should be a trail rather than a cloud. Black smoke indicates too much gasoline in the carburetor mixture, and will result in sooted and irregular sparking plugs. If the engine chokes and emits black smoke when suddenly given more throttle, the carburetor is usually at fault, and it is best to consult an expert carburetor adjuster.

When descending steep hills, shift into middle or low speed, cut out the spark, and let the car operate the engine, as much brake wear is thus avoided. With practice it is possible to see reasonably well around a corner. Show windows frequently afford reflections of the side street.

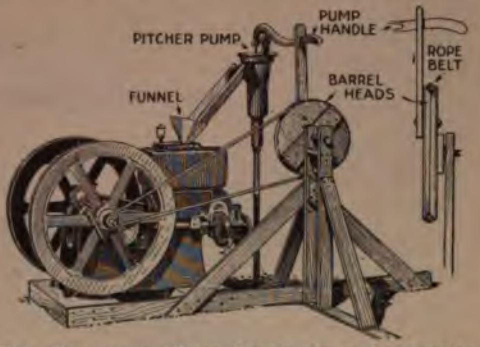
On motorboats, carry adequate lifesaving apparatus at all times when the craft is in commission. Even though willing to assume a dangerous risk, it is well to remember the government requirements, and that inspectors are paid to guard boat owners from their own recklessness in disregarding dangers.

Have at hand in the automobile, or motorboat, the following items of equipment: Shellac, tire tape, graphite, rubber and asbestos packing, cotton wicking, waste, overalls, hand soap, towel, dry-battery tester, extra spark plugs, matches, and a trouble lamp. Lastly, know the rights on the water or the road, use caution, and have consideration for the "other fellow." Happily, friendliness and rendering of assistance are quite common among drivers of gasoline motors on the road as well as on water.

Temporary Pump for Cooling a Gas-Engine Water Jacket

A pumping engine for flooding a cranberry bog at a critical time was put out of commission by the breaking down of the circulating pump supplying the water jacket. The owner devised a substitute as follows: Two barrel heads were nailed together so the beveled edges formed a grooved pulley wheel, as shown. The pulley was then mounted on a pipe shaft in a wooden framework, and lined up with one end of the engine flywheel shaft. The belt was a piece of spliced rope.

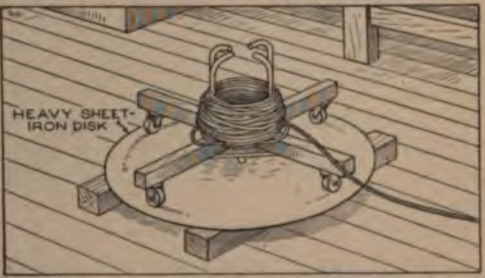
A pitcher pump outside the engine house was driven down, as indicated, opposite the wooden pulley, and a wooden arm was bolted to the pulley. The upper end of the arms was slotted to fit the pump handle, this arrangement giving a 2-in. stroke to the pump. The old circulation pump was disconnected, and the water pumped was conducted to the engine by means of a trough.—L. B. Robbins, Harwich, Massachusetts.



This Emergency Water Supply for a Gas-Engine Water Jacket Proved Serviceable for Several Months

Roller-Bearing Reel for Electrical or Other Wire

To replace cumbersome horizontal-drum wire reels on his various jobs, an electrical contractor designed the reel shown. It feeds out the wire in various directions without jamming. The framework is a wooden cross, and rods serve as a drum for the wire coil. Casters are provided to operate on a disk of heavy sheet iron, bolted to a wooden foundation. The reel is held in position by a long bolt, and is free to turn. The coil is placed in position quickly, and the device is readily portable.

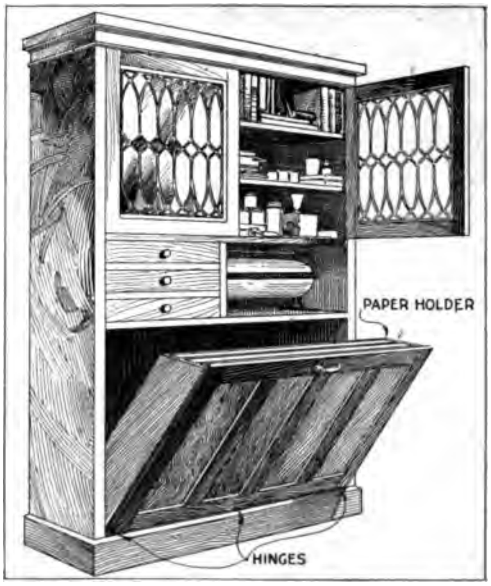


The Wire may be Drawn from the Reel Easily in Various Directions

¶A pocket in the front cover of a schoolbook is convenient for carrying notes and papers.

Artist's Cabinet Made from Old Sideboard

The great miscellany of material, tools, paper, sketches, etc., with which an artist works were cared for economically by providing a cabinet for them, which was adapted from an old sideboard, or china cabinet. Adjustable shelves were fitted into the upper cupboard for books, tools, etc. Three shallow drawers were built into the center section, which was an open shelf. At the right of this shelf a roll of paper was mounted in a holder. The lower section was provided with a hinged door to which the cupboards for mats, paper, etc., were fixed.—John T. Bowe, Chicago, Ill.



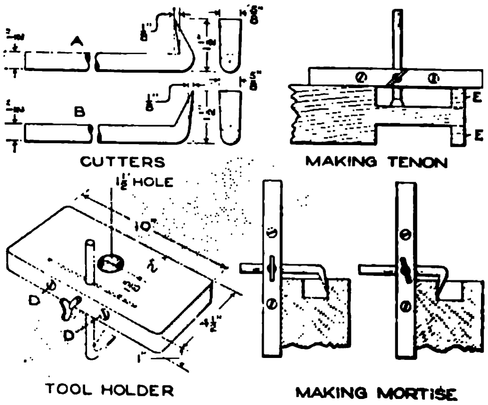
Instead of Using Various Makeshifts, an Artist Rebuilt This Cupboard to Suit His Special Needs

Hand Tool for Making Mortise-and-Tenon Joints

One of the chief causes of failure in home woodworking by intelligent, though inexperienced, persons is lack of knowledge in the proper use of chisels in making joints, particularly the common mortise-and-tenon variety. This joint must be exact in its construction or it is almost worthless. Having to build with the aid of inexperienced helpers, several pieces of furniture in which were many mortise-and-tenon joints, to be made by hand, I made a device that did the work rapidly and accurately.

First, I had made two tools, A and B, of ½-in. tool steel, grinding them carefully. Tool holders of maple, as detailed, were made, the screws D preventing splitting, when the wing screw, which holds the cutter, is tightened. The 1½-in. hole is an outlet for chips. The various steps in making a mortise and tenon with this router are: First, saw and chisel for the tenons, as detailed, leaving strips E as bearings for the router and removing them later. Trim both sides of the tenon at one setting of the tool.

To make the mortise, use the tools as shown. The two tools make it possible to cut both sides of the mortise from the same side of the piece. Make all of the similar cuts with one setting of each of the tools, using a chisel for preliminary work, as usual, to within a scant $\frac{1}{16}$ in. of the lines.—D. D. Gurnee, Hempstead, N. Y.



By the Use of This Homemade Router Mortises and Tenons were Cut Quickly and Accurately by Inexperienced Workers

---

Indicators having a metal point require a specially coated paper of good quality. Apply a thin coating of this mixture, by weight: 1 part zinc oxide, 4 parts water, $\frac{1}{10}$ part gum arabic. Permit it to dry thoroughly.

A Submarine Chase in a Display Window

By HARRY MARCELLE

DIPPING in the waves, now submerging, only to reappear and continue the pursuit of the giant liner tossing on a choppy sea, a daring submarine holds the attention of spectators before a novel window display, depicting "Somewhere off the Irish Coast." The endless water stretches out in the background, and the chase continues while the faithful electric motor keeps the "wheels going round." The rolling cardboard waves, and the pitching vessels on the ever-changing scene, produce the effect of a ship attempting desperately to elude its submarine enemy.

A painted background of a marine view, in water colors, or flat oil colors, is set up behind the display. The waves are painted on heavy cardboard, or better still, beaver or compo board, 18 in. wide, and of a length to suit the size of the window. A strip, 2 in. by ¾ in., extends along the bottom of each wave, holding it in an upright position, and forming a base for the wave, when riding on the cams, as shown in detail. Five waves are shown in the illustration, Fig. 1. A stationary one is in the front of the window, to hide the mechanism, which is 2 ft. in width. The other four travel on the cams, mounted on shafts, as shown. The cams are set so that their high points are opposite those of the adjoining cams, to produce alternations in the wave motion. The ship is made of the same material as the waves, is 3 ft. long, and placed in front of the last wave. The ship also

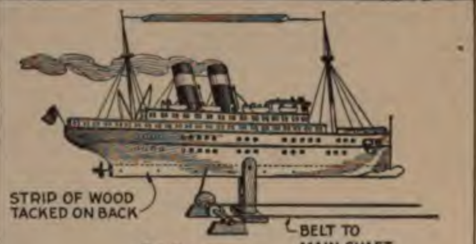


Fig. 2.

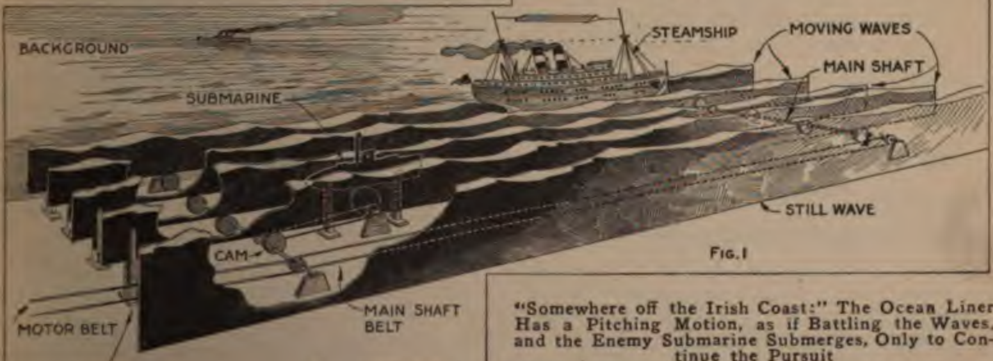


Fig. 1

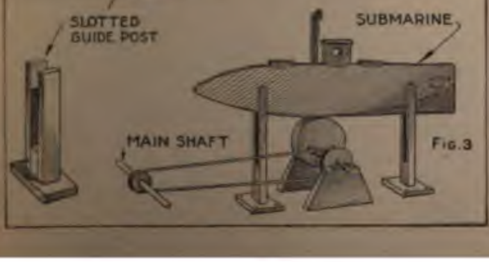
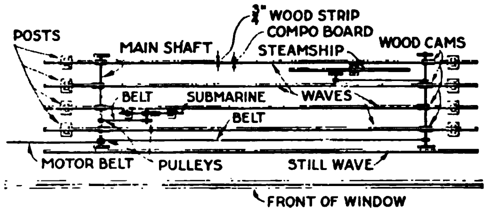


Fig. 3

"Somewhere off the Irish Coast:" The Ocean Liner Has a Pitching Motion, as if Battling the Waves, and the Enemy Submarine Submerges, Only to Continue the Pursuit has a strip tacked to the bottom to strengthen it. The submarine is built similarly, and is 24 in. in length.

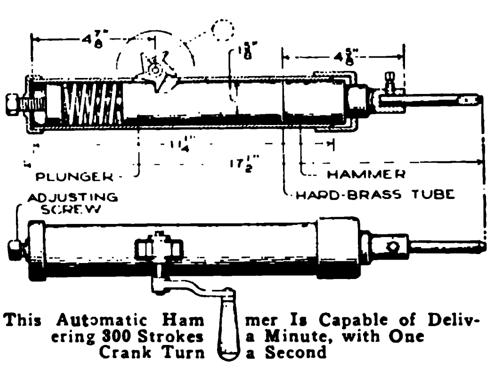


Plan View Showing Details of the Driving Mechanism, and the Relative Positions of the Waves, Boats, and Other Parts

The wood disks for the cams are cut 8 in. in diameter, out of 1-in. lumber. Two shafts are provided, and in each disk a hole is drilled, 3 in. from the edge, to fit the shafts tightly, thus making cams of the disks. Seven grooved wooden pulleys, of proportionate sizes, as shown, are also placed on the shafts. Eight uprights, as detailed, are provided, in which the waves ride. One upright is used on the large ship, which is balanced on a nail shaft, placed in the end of the upright support, as shown. A small countershaft, belted from the main shaft near the liner, oscillates the steamship, by means of a wire crank, as detailed in Fig. 2. The submarine rides on the cam only, and is not pivoted in the center, as shown in Fig. 3. It is also driven from a countershaft. This gives it the effect of being submerged, and slowly rising to the surface. The ship has a pitching motion, as if battling with the sea. A large cam is used on the submarine countershaft, and a small pulley belted from the main shaft, so that the action of the submarine is not as frequent as the tossing and pitching of the steamship. The submarine is placed to the left of the display, between the second and third waves. The display is operated by an ordinary electric-fan motor, and can be driven by various other kinds of power. Of course, much depends upon the artistic and mechanical ability of the maker in painting the background, waves, and boats, as well as in making the parts.

Automatic Hammer for Light Work

Electricians, tinsmiths, gas fitters, and others doing light riveting, chipping, and the like, will appreciate the advantages of this automatic hammer. It can be used in places inaccessible with a hand hammer, it will not split or smash a rivet, and all of them will be hammered uniformly. By using form dies, the rivet head may be formed round, square, oval, star-shaped, or in other designs. It has no valves to get out of order, and no joints to regrind, or glands to pack. As there is no pressure used, save that of a spring, very accurate fits are not essential in its construction, and only a few simple parts are required.



This Automatic Hammer Is Capable of Delivering 300 Strokes a Minute, with One Crank Turn a Second

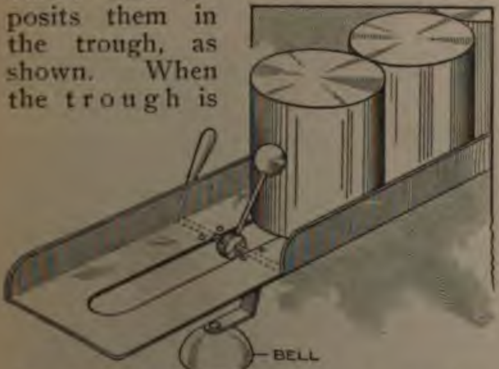
In use, the tool is held in one hand, and the riveting die is pressed against the rivet; then the crank is turned as indicated. The star wheel engages the plunger, and forces it back against the helical spring, compressing the latter. The tooth frees itself from the plunger, and the latter is driven forward by the spring, and strikes the hammer and tool holder, delivering the blow to the rivet. The force of the blow is regulated by tightening or loosening the adjusting screw; the length of stroke is not variable, being controlled by the size and number of teeth on the star wheel, and the depth of the recess in the plunger. On a short stroke a heavier plunger must be used, since the direct weight must be made up in the weight of the plunger. The hammer is proportioned for work up to riveting ¼-in. soft-brass rivets.—J. B. Murphy, Plainfield, N. J.

Inclines to Platform Scale Save Lifting

Many shops cannot afford a large built-in scale with a platform on a level with the floor. Such scales save much labor of lifting, since crates or barrels can be pushed or rolled directly onto the platform. An ordinary platform scale can be made to serve as a good substitute if inclines are built up to its side. These inclines, made from wood and well supported, should be portable, so that the scale may be used in various parts of the shop. Barrels, heavy crates, etc., can be moved to the platform with rollers, instead of the block-and-tackle arrangement otherwise required.—F. M. Ball, Kansas City, Mo.

Bell Signal Calls Automatic-Machine Operator

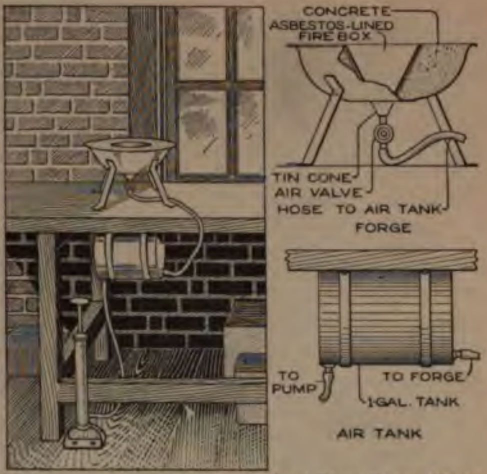
A signal bell is used in connection with an automatic machine which fills cans and deposits them in the trough, as shown. When the trough is full, the front can actuates the clapper, which falls through the slot, striking the bell. This calls the attention of the operator, who removes the cans from the trough. The handle beside the trough is used to return the clapper into position for the next batch of cans.



The Clapper is Automatically Tripped against the Bell, Warning the Operator

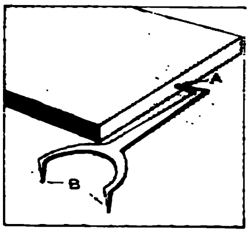
Charcoal Forge Made of Washbasin and Concrete

While engaged in some experimental work at home, I made a small forge, and it worked so well that I pass the method on to others. Its construction is very simple. An old granite basin from the kitchen was filled with concrete, and a hole left for the fire box. While the concrete was still wet, a sheet of asbestos was laid around the inside. This keeps the cold concrete from the fire, and makes possible a greater heat. An old fixture from a discarded oil stove was connected to the tin funnel extending to the rubber tubing from the forge, to regulate the air flow. A gallon can, with the proper accessories, was used to regulate the otherwise uneven flow of air from the pump, and to store a pressure supply. The pump was an ordinary tire pump. Legs for the basin were made of strap iron and riveted to the basin, so that it may be more easily handled and the regulating valve underneath reached handily. Charcoal is used in the forge, homemade wood charcoal being prepared with little trouble. The forge melts most of the common metals in small crucibles, and the heat is localized so that it does not heat the room to any considerable extent.—Dale R. Van Horn, Milton, Wis.



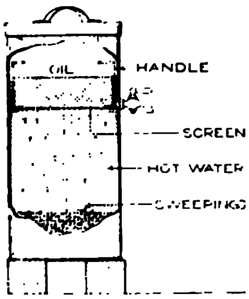
This Concrete and Asbestos-Lined Blast Forge, Made for Temporary Use, Became a Permanent Shop Fixture

A Handy Sheet-Metal Bench Dog



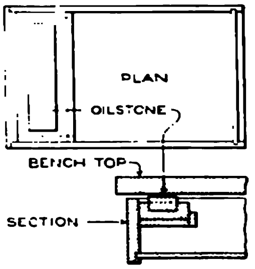
The carpenter's workbench is not complete without a bench dog and a bench stop. When cutting a mortise, or using a router plane, scraper, or sandpaper, it is often necessary to hold both ends of the board rigid. The bench dog shown is especially handy, being cut from a piece of sheet steel, 1/8 in. thick. It is 6 in. long, and the points B are 2 in. apart. To use it, place the board on the bench with one end firm against the regular bench stop; then drive point A into the other end as far as necessary, being careful to hold points B close to the top of the bench. Next drive points B into the bench, holding the board perfectly.—John Countermine, Vinton, Iowa.

Can for Recovering Oil from Chips and Sweepings



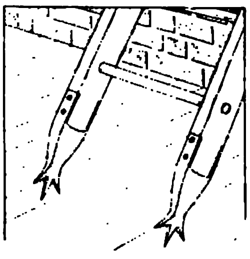
Around lathes, tapping and milling machines, etc., considerable quantities of expensive oils are used, so that the borings and chips are coated with it. This oil is often wasted, and to save it, I devised this oil-recovering can, which soon paid for itself. To make the device, get a 5 or 10-gal. can, and provide a cover. Fit in the tray of screen wire, with two handles soldered on, as shown. On one side of the can fit a small drain cock. To use the reservoir take out the tray and fill the can with hot water up to a few inches of the tray. Throw the chips into the water. Put the tray back in place. The oil rises to the top of the water where it can be drawn off. The screen tray is necessary only when wood or sawdust is mixed with the chips, the screen preventing them from rising in the oil.—M. S. Hay, Denver, Colo.

Whetstone and Strop Kept Handily in Bench Drawer



The disagreeable mess often caused by using a whetstone on a clean bench top can be avoided, and the stone made more quickly available, if the latter is placed in a specially constructed drawer in the bench. The drawer consists of a frame 2 in. deep, having a bottom and sliding on two strips in grooves. The oilstone is mounted in a wooden block fitted inside the drawer snugly, and resting on guide strips. It is arranged so that the top of the stone just clears the bench top and extends slightly above the edge of the drawer front. The stone and block may be removed from the drawer if desired, and sharpening accessories, strop, etc., are also kept in the drawer.

A Nonslipping Ladder End



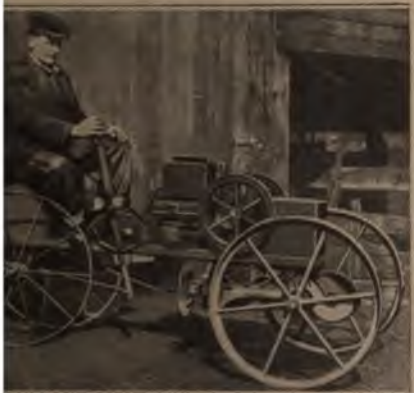
A large steel mill adopted the nonslipping ladder end shown in the sketch, to reduce the number of accidents caused by the slipping of ladders. The feet are made of steel and fastened to the ladder ends with rivets. The teeth are filed sharp, and kept well pointed. This type of foot is superior to the common single-prong variety, because at various angles there is always a sharp prong squarely against the floor.—E. B. Hanson, Duluth, Minn.

ll Power-Plant Tractor Made of Engine and Mower

By LUTHER STROSNIDER

mounting a 1-hp. engine on a eavy plank, supported on driving ls obtained from an old mower teering wheels from a light farm ine, I get much more use out of ower plant than when it was set portable carrying frame, or on The outfit is rigged so that it under its own power, climbing ıry hills, and making it prac- a small tractor, useful in many on the farm. It is guided by ghter wheels, which are pivoted e center of their axle, and con- l by the hand lever, as shown in . This outfit has been used for orn sheller, grindstone, sausage feed grinder, pump, washing ine, and wood saw, and I have it a few times to draw a wagon, d of going a considerable dis- to get a team.

old mower wheels and driving vere set so that the pitman shaft izontal, as shown in Fig. 1. An bevel gear was set on the end of aft, to engage a small pinion set second shaft which runs across the plank, and is bracketed from h heavy strap iron, as shown from pposite side, in Fig. 2. On this the second shaft, a clutch device anged, two pins fitting into holes ulley, which has a rim to prevent the belt from slipping off when the clutch is released by means of the slanting rod.



This View Shows the Mower Pitman and the ng Connecting It with the Engine, and Also Steering Lever, Gripped by the Driver

The power is belted from the engine shaft, where a wide pulley is set, to the flange pulley on the lower shaft, as shown in Fig. 2. The lower shaft and pitman shaft are engaged only when moving the power plant. When in use on a saw or other machine, a belt is fitted from the engine pulley to the pulley of the machine being driven. The tools and other equipment for the outfit are kept in the tool box, mounted on the plank.

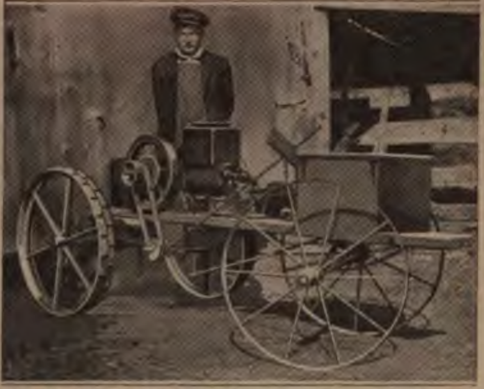


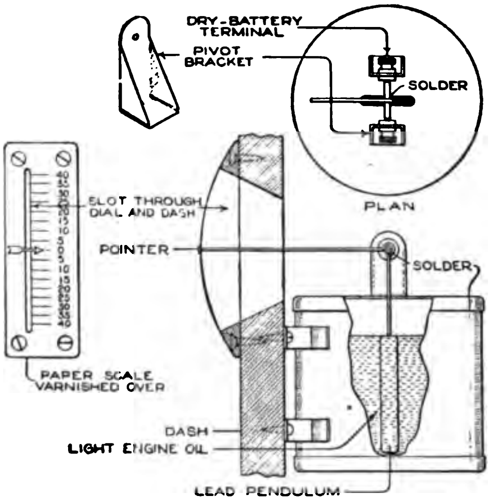
Fig. 2. The Belting of the Power from the Engine Shaft to the Lower Shaft, Which Connects with the Pitman Shaft on the Opposite Side, and the Clutch-Control Rod are Shown in This View

Liquid Glass Used to Make Asbestos Packing Stick

In setting pipe covering on valves, tanks, and other similar surfaces, it is often difficult to make the covering stick. To overcome this, give the surface a coat of silicate of sodium, known as water glass, and apply dry asbestos by the handful while the surface is wet. The silicate sticks to the metal and retains sufficient asbestos to form a ground for the later coats, applied with a trowel. Wire mesh may also be wrapped around certain forms on which the asbestos will not stick readily, and provides a good foundation.

A Grade Indicator for Motor Vehicles

The construction of a grade indicator suitable for automobiles, for use on railways, etc., is shown in the sketch.



The Pointer Shifts Steadily as the Grade of the Road Changes, Indicating the Percentage

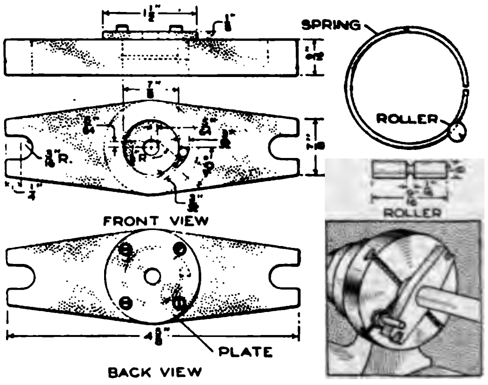
It was made of a baking-powder tin, partly filled with engine oil, in which is suspended a lead pendulum attached to a pivot. Dry-battery terminals form the bearings. The pendulum and pointer arms are of steel wire, soldered to the pivot. The paper scale is glued to a wooden back and is graduated in grade percentages, and not in degrees.

The lengths of the arms and dimensions of the parts are omitted as they may be varied. The spacing for the graduations is varied to suit the radius of the pointer. The arm that carries the pointer is of light material and the pendulum reasonably heavy. The liquid steadies the oscillations of the pointer. When attached to an automobile, the device indicates the proper time to change gears, as well as provides a measurement of gradients. An instrument similar in principle is used on aeroplanes to bring the craft on an even keel, when dropping bombs or other explosives.

The scale is determined by using the following degree indications in marking it, the figures being for grades of 0 to 40 per cent, inclusive, at intervals of five per cent: 2°.52′; 5° 43′; 8° 32′; 11° 19′; 14° 3′; 16° 42′; 19° 18′; 21° 48′. This range is satisfactory for all ordinary gradients that a motor vehicle can make.—G. A. Luers, Washington, D. C.

Steel-Roller Lathe Dog for Making Small Spindles

In turning and grinding small steel shafts it is usually necessary to grip the finished end with a copper dog so as not to mar the work. The steel-roller dog shown in the sketch is superior to this, and for quantity production the making of a set of these dogs was found economical. The dog grips the shaft automatically, and the gripping surface is of sufficient width so as not to mar smooth bearings. The dog is essentially a piece of steel, of the shape and dimensions shown, and having a hole bored through it, the size of the finished shaft on which it is to be used, plus .002 in. A small steel roller fits into an offset at the side of the hole, and is free to roll about one-eighth of the circumference. When the dog is placed on a shaft and revolved counterclockwise, the roller is forced against the shaft, gripping it firmly. The roller is held in place by a spring ring, fitted into a groove, as detailed. The dog is made of iron, casehardened, and the roller of tool steel, hardened. —Hubert Kann, Pittsburgh, Pa.



This Lathe Dog was Found Economical for Polishing Steel Shafts in Large Quantities

ınting Small Parts by Weighing Them

ırchases of small machine parts, vs, bolts, washers, etc., in large tities, usually require that be checked as to number, counting them is tedious. rdinary scale, with a scoop was used in counting to t advantage. First the y scoop was set on the orm, moving the hanging ht along the scale beam it balanced the weight of scoop. The parts were ed into the scoop, until a ble, easily calculated ht, 10 lb. for example, was tered. The parts weighed counted, and succeeding hes poured into the scoop the unit weight was reged. Thus, the total numof parts was recorded in for easy calculation. If cially accurate results are ed, several tests for the ber of parts in a given ht may be made, and the ber determined by an average.—[. Hall, St. Louis, Mo.

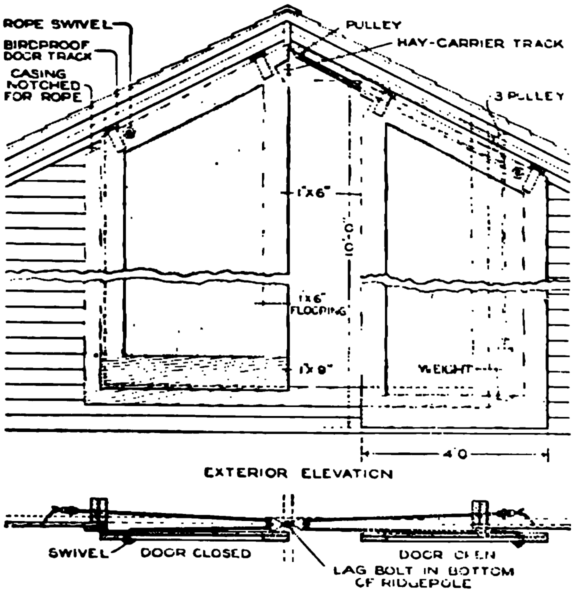
yeshade Carried Safely under Shoulder

equently it is desired to take an hade from the place where it is ordinarily used, and those who have tried it know how easily the shade is damaged. By carrying the eyeshade under the shoulder, as shown in the illustration, the shade lies flat, fitting the curve of the body. It

ıtirely comfortable to the person ying it and not likely to be broken. . Chait, New York, N. Y.

Sliding Gable-End Hay Doors Easily Operated

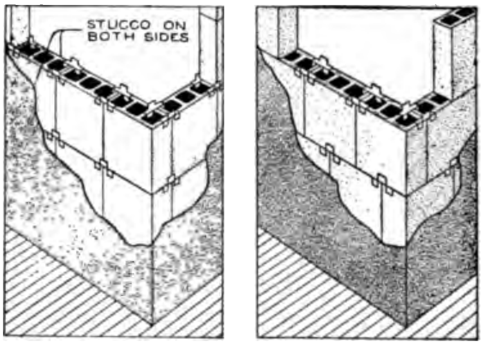
Hay doors hinged in the gables of barns are troublesome when the crop is being hoisted into the mow, and are a constant source of annoyance through damage from the wind or by the weakening of the hinged fastenings. By using sliding doors in the gable, these troubles are easily avoided. Sliding doors, as detailed in the illustration, can be installed easily to operate on the incline of the roof, under the eaves. Provision is made for the usual hay-carrier track, extending under the ridgepole. The doors are strongly framed and suspended on a bird-proof track, from roller hangers, and are counterbalanced by weights suspended on ropes, run over 3-in. pulleys, as shown. This makes it easy to slide the doors into place up the incline. The sectional plan shows the arrangement of the rope counterweight device, and the pulley rigging is also shown in the sketch. By extending the control ropes, the doors can be opened from the barn below.—W. E. Frudden, Charles City, Ia.



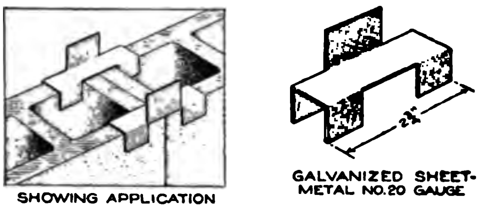
The Doors are Easily Slid into Position on the Inclined Tracks by Reason of the Counterweights

Hollow-Tile Wall Construction Using Metal Bonds

Hollow tile is a sanitary material for building purposes, especially adapted for residences. In the ordinary form of structure, the tile are laid up in mortar, and most building ordinances require them to be 6 to 8 in. thick. This new wall construction, using tile 4 in. thick, provides a very strong, rigid wall. A metal bond is used, and holds together the adjacent tiles, preventing not only lateral displacement at the joints, but deflection in the wall.



JOINTS MATCHED JOINTS STAGGERED



SHOWING APPLICATION OF BOND

GALVANIZED SHEET-METAL NO.20 GAUGE

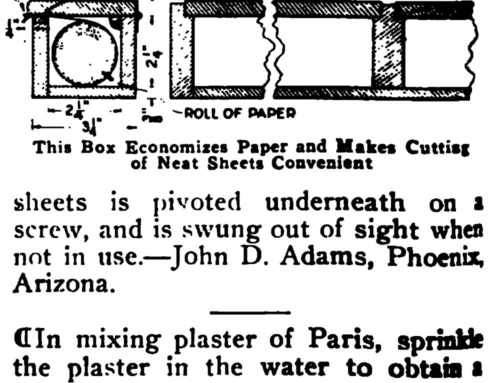
A House was Built of Tile at Much Less Expense and Time, by the Use of Metal Bonds, and Proved Substantial, Not a Crack Developing in Four Years

The bonds are made of No. 20 gauge galvanized sheet steel. They are 2¾ in. long, and of such size in cross section that the side wings will clasp the web of two abutting tile. The upper side of the bond has an upward projecting wing, to hold the next tile above. Two bonds are used at each joint, as shown.

The tile can be laid with matched or staggered joints. In a building constructed with the bonds four years ago, there is not a single crack. The building was laid up without mortar, and the stucco, or concrete, applied afterward. Partitions can be run from the walls, the same bond being used. The bonds cost less than the mortar usually employed, and the cost of putting up the tile was less than half that under the usual method. The mortar or cement forced into the cracks between the tile assures a perfect seating of the tile. This bond without mortar assures perfect seating of the tile as they are laid in, and the stucco or concrete finish on both sides is not necessary to make a rigid wall.

Blueprint and Roll-Paper Box with Sheet Cutter

Frequently in drafting rooms the rolls of prepared paper, tracing cloth, etc., are kept in a cupboard or closet. A more convenient plan is to make a long narrow box, with a hinged top. A strip of heavy felt is glued along the top edge and a strip of heavy tin, or galvanized iron, is nailed on the under side of the cover. A small catch at each end keeps the cover against the felt. When paper is required, pull out as much as desired and tear it off against the metal edge. The box has two compartments with independent lids. A yardstick for measuring the sheets is pivoted underneath on a screw, and is swung out of sight when not in use.—John D. Adams, Phoenix, Arizona.



This Box Economizes Paper and Makes Cutting of Neat Sheets Convenient

---

¶In mixing plaster of Paris, sprinkle the plaster in the water to obtain a smooth mixture.

Pointers on the Use of Valves

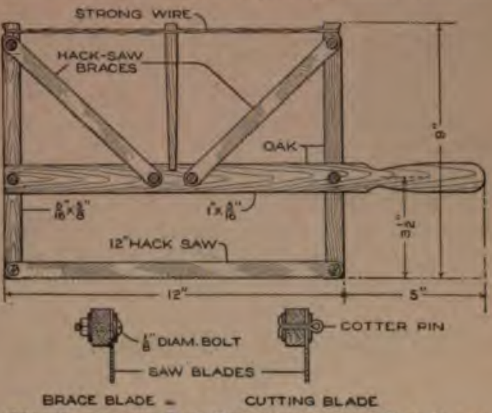
n angle valve is generally more sfactory than a globe or gate valve an ell, when a valve is required a right-angle turn in a pipe line. lemands fewer joints to be kept t, and makes a better-looking job. s friction is also caused by water steam passing through the line. ss or gun-metal valves should be l on pipe lines that convey supered steam; never use rubber-disk es for such duty. In taking down es, especially those of brass, use a nch that fits the nut portion closely, hat the corners will not be worn off he slipping of the wrench.

Old Street-Car Gongs Used as Hardware Trays

n ingenious use of worn-out and ked street-car gongs is made by a street-railway company in its shops. The old gongs are utilized in making convenient stands to hold small materials, such as washers, screws, nails, nuts, etc., in the storeroom and the shops. A gong weighted with babbitt is used as a base, and the other gs, inverted, are fastened by pins an upright, to form receptacles, as wn. Graduated holes in the pipe ight provides for adjusting the reacles.—Ralph O. McGraw, Chicago, iois.

An Emergency Hack-Saw Frame

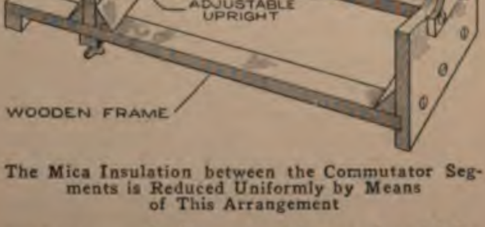
n a hurry-up bench job in a mae shop, the only available hack-saw ne broke, and it became necessary rovide a substitute or abandon the A satisfactory frame, that has proved useful as a regular tool, was made in a few minutes, as detailed in the sketch. The main portion of the frame was made of $5/16$-in. wood and a handle was cut on the crossbar. The saw blade was fitted into place, as shown in the detail, and braces were made of saw blades. A strong wire, tightened with a tourniquet, braced the frame at the top, and made the cutting blade rigid.—J. C. Marsh, Boston, Massachusetts.



This Emergency Tool Proved so Useful That It was Kept as a Regular Part of the Shop Equipment

Device for Undercutting Mica on Commutators

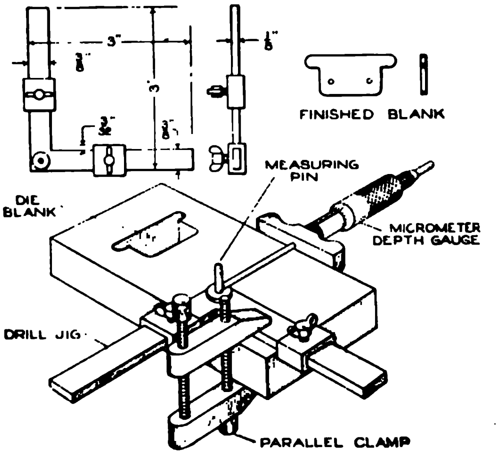
The mica insulation between the commutator segments of copper, on motors or similar machines, should be kept below the surface of the seg-



The Mica Insulation between the Commutator Segments is Reduced Uniformly by Means of This Arrangement ments. Where a number of small motors are to be cared for, a frame for holding the armature conveniently, and a device for cutting the mica are timesavers. In the arrangement shown, the armature is mounted between pointed machine screws set in metal plates, fastened to the ends of the frame. The latter is adjustable, and the cutting device is made of a piece of drill rod suitably ground and handled, for clamping in a sliding block, set on a guide rod.—R. L. Hervey, Baltimore, Md.

Jig for Piercings on Dies and Machine Parts

A fixture, or jig, for locating piercings can be used to good advantage on follow dies, or dies that blank and pierce the stock in one revolution of the punch press, in which the die is held. That shown in the illustration consists of a 3-in. right-angle square, made of ⅛-in. flat, cold-rolled steel, or ground stock. Two adjustable sliding stops of machine steel are fastened with thumbscrews. The bushing at the corner of the square is of hardened tool steel and set with a drive fit. The center hole in the bushing can be of various desired sizes. A number of different-sized bushings are convenient. A small pin fits the bushing, and is used as a measuring point, as shown. The fixture is placed on the die to be drilled, and set so that the center of the bushing is in about the position in which the piercing is to be drilled. The stops are then set, and the fixture is clamped to the die. With a micrometer depth gauge, the fixture is set precisely in position.—William E. Jewett, Jersey City, N. J.



The Piercings on Dies are Located Quickly and Accurately by Means of This Jig

Economy by Use of Government-Size Letter Paper

While trying to stow away in my files an 8½ by 11-in. sheet of 20-lb. folio bond paper, now selling around 40 cents a pound, I wondered why more persons do not save paper by using the 8 by 10½-in. size, weighing one-fourth less in folio weight, and nine per cent less because of its size. A typical sheet of this size is equivalent in weight to 16-lb. folio stock—17 by 22 in.—but in cutting four sheets out of a paper 16 by 21 in., I get nine per cent more sheets, by weight, for the same money. This size sheet is satisfactory for letters and manuscripts, and often saves postage. The government has used it for years, and many of the government sheets are only half this size.—J. Cecil Alter, Cheyenne, Wyo.

Grinder as Winch for Hoisting Countershaft

Supporting a piece of machinery against a ceiling while bolting it in place is often a trying and difficult job. Two boys had such a job in the shape of a countershaft and shifter for an emery-wheel grinder, the part being too heavy for them to handle. Two block pulleys were attached to the ceiling timbers. Two pieces of rope were tied to the lower parts of the countershaft, the other ends being attached to the grinder shaft, which was turned by a wrench, making a crude winch. The grinder was bolted to the floor. The countershaft was safely raised, and held in position, while the lag screws were tightened.—E. H. Post, Pittsburgh, Pa.

A Homemade Hydraulic Ram

By B. FRANCIS DASHIELL

THE hydraulic ram is used where considerable flow of water with a moderate fall is available, to raise a small portion of the flow to an elevation. The principle upon which it operates is as follows: An outflow of water falls through a pipe; when the lower end is suddenly closed, the movement is arrested, and the momentum of the current in the pipe forces a small portion of the water, through a check valve, into an air chamber, and out into the delivery pipe. When the momentum is down to normal pressure the outflow valve drops open of its own weight, and the delivery check valve closes, as shown in Fig. 1. The cycle repeats itself about 40 times a minute. Thus, the water is elevated by a succession of impulses.

A hydraulic ram, as detailed in Fig. 2, is easily built. The diagram, Fig. 1, shows the operation of the ram, the water being drawn from a reservoir, or spring, through the inclined drive pipe A to the ram. It overflows through the vertical check valve B. When the velocity of the water through the pipe reaches a certain pressure, the valve is closed. The extreme pressure in the pipe at this moment is great enough to force open the check valve C, and drive some water into the air chamber D, and thence out of the delivery pipe E.

In Fig. 2 the parts are shown assembled. The ram should be set in a vertical position. The supply pipe should be 1 in. inside diameter, and the delivery pipe ½ in. Set the ram about 5 ft. below the level of the supply dam, or reservoir, and not over 60 ft. away. The supply should have at least 8 gal. a minute to give good results from the delivery. It will lift water over 20 ft. above the ram, and 200 ft. away, but, of course, the farther away the water is to be delivered, the less will be obtained, owing to the considerable resistance of ½-in. pipe. Fix a strainer over the drive-pipe intake to keep dirt from getting into the ram, and preventing the valves from seating properly.

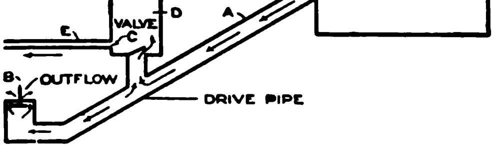


Fig. 1. Diagram Showing Operation of the Hydraulic Ram

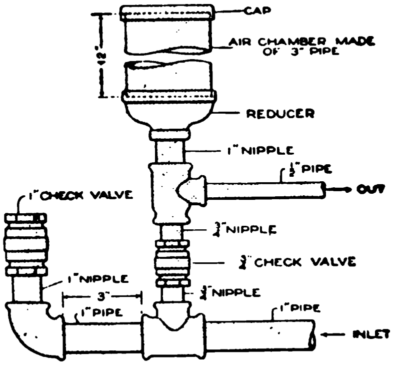
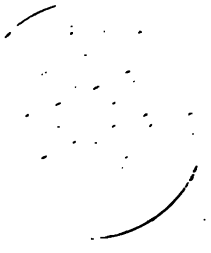


Fig. 2. Assembly Drawing of the Pipes and Fittings of Which the Ram is Made

Engine Nut Recovered with Pill Box on Stick

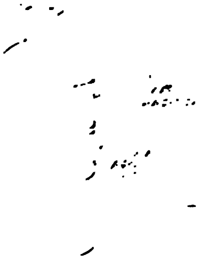
I removed a castle nut from my motorboat engine pump, and it dropped from my greasy fingers through several openings to the engine bed. None of the openings near it were large enough to permit inserting pliers or similar devices. Here I was, 50 miles from a good machine shop or other source for obtaining a like nut. I finally used soap, as burglars sometimes do. I tacked a small pill box on a stick, and filled it with soap. I inserted the stick into the engine pit, and there was the castle nut imbedded in the soap.—Egbert A. Clark, Washington, D. C.

Stove Lid Used to Repair Forge



[illegible] tight, satisfactory repair was made by [illegible] Canada.

Cutting a Glass Tube or Bottle



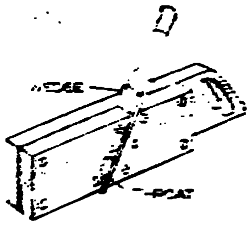
[illegible] glass [illegible] carefully [illegible] and [illegible] flame on this line, while [illegible] bottle.

Brass Guide Strip for T-Square

[illegible] an annoyance [illegible] working edge of a drawing board [illegible] or wear, so that the head of the T-square does not fit snugly against it. I have overcome this difficulty by fixing a metal edge on the board. I fastened a strip of aluminum (brass will serve) 3/32 by 1 in., to the working edge of the board with small screws, rabbeting it in flush with the top. The metal projects 3/16 in., and fits into the groove in the head of the T-square, holding it firmly in place, yet permitting it to slide freely.—Guy E. Waite, Ottawa, Ill.

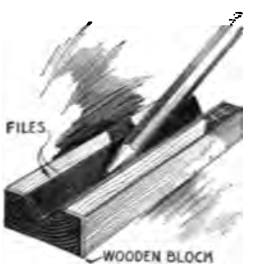
A Homemade Rabbet Plane

In making skis it was necessary to groove them, and I made a rabbet plane for the purpose. Two pieces of 1 by 4-in. board were cut 12 and 14 in. long. Two hand holes, and a few cuts with a keyhole saw effected a handle in the longer piece. The short piece was cut in two at an angle, and the pieces fixed to the longer piece with screws, leaving a slot for a [illegible]-in. chisel, and a wedge. A throat was cut, as shown, for the shavings. A slight tap on the chisel at each complete stroke permitted the cutting of the groove to the desired depth.—Victor Pare, Gladstone, Mich.



Pencil Sharpener with V-Groove Made from Files

An efficient pencil sharpener may be made from two files and a block of wood, 2 by 3 by 5 in. long. In the top surface cut a 45° groove, as shown. Break the files to two 5-in. lengths, fit them in the groove, and glue them in position. The rough surface of the files holds the glue nicely. The block is held in the left hand, and the pencil point rubbed, with a twisting motion, in the file-lined groove, with the right hand, sharpening the pencil in a few moments. By holding the pencil at different angles, various degrees of fineness of point are obtained.

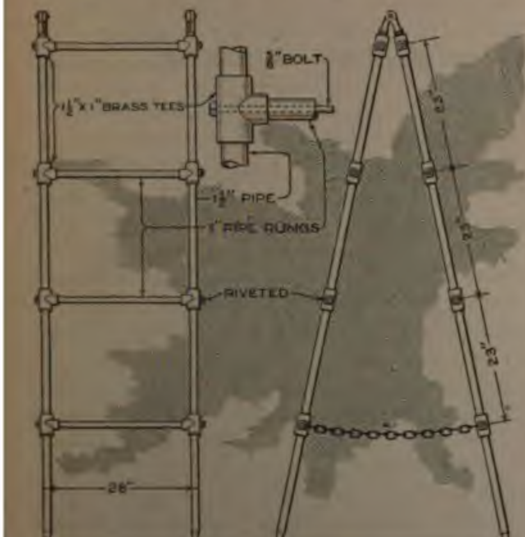


Revolving File Cabinet on Double Desk Saves Time

A revolving file cabinet, mounted at the center of a large double desk, solved the problem of making the files readily available to two clerks in an office where space was valuable. A cabinet was provided, with short filing drawers, and compactly and lightly built. It was fixed to the center of the desk top by means of an iron pedestal, provided with a center shaft, around which the cabinet turns.

Shop Ladder Made of Pipe and Fittings

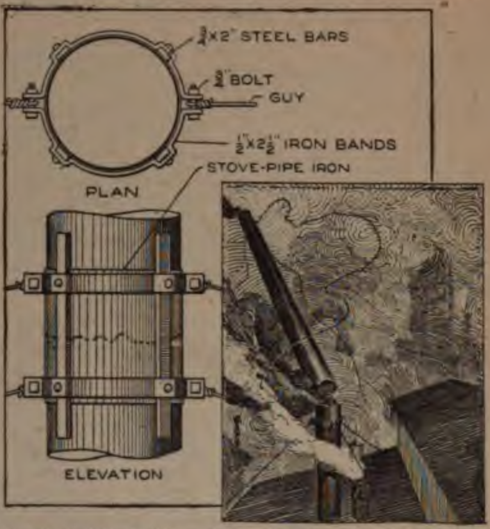
In a railroad repair shop where ordinary ladders were found bulky when made strongly enough, ladders built up of pipe and fittings, reinforced, were made and used with satisfaction. They were built of 1½-in. pipe joined with tees, and bolts were passed through the tees and rungs for further strengthening. The ladders being 28 in. wide, it is possible to pass planks at any of the rung levels. The ends were pointed to give a secure footing.—Joseph K. Long, Renovo, Pa.



This Strong Ladder was Designed for Use in a Railroad Shop

Reinforcing a Blown-Down Iron Smokestack

One of the guy wires running to the top section of a 60-ft. iron smokestack broke during a high wind, and the stack broke off just above the ring to which the lower guys were fastened. The loss of time to get a new stack would have been great, and the old one was, therefore, patched up and proved satisfactory for continued use. The broken-off section, which remained intact, was hoisted back in place, and kept in line by guys and a set of clamps and bars made for the purpose, as shown in the detail sketch. Guys were run from the clamps on each side of the break, and the stack was made rigid. Around the break, two thicknesses of stovepipe iron were wrapped, before the clamps were put on, to stop leakage.—Donald A. Hampson, Middletown, N. Y.



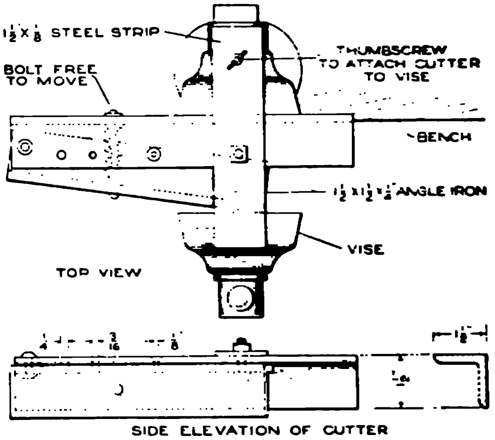
A High Wind Blew Down the Smokestack, and It was Quickly Repaired at Little Expense

Wire Mesh for Rough-Surfacing Concrete Walk

Concrete walks can be made with a rough surface, when a regular rough-surfacing roller is not at hand, by applying wire mesh, pressing it firmly on the surface, while the concrete is slightly soft.—H. K. Capps, Stahl, Mo.

A Shear of Angle Iron for the Vise

A useful piece of apparatus for the workshop is a vise shear, easily made out of two sections of 1½ by 1½-in. angle iron, riveted together as detailed, and fitted with a stiff spring, on a bolt, which opens the cutter when the vise is released. Holes, the size of the rivets or rods to be cut, are drilled through both pieces of angle iron, when they are in position, as shown in the top view. Both pieces are casehardened around the holes. A metal strap is fastened to the stationary angle iron by bolts, to hold the shears in the vise. A hole is drilled and tapped in the vise to take a thumbscrew, which steadies the shears. The stock to be cut is placed in the hole of the same size diameter, and the vise is tightened to shear the stock. When one requires a number of rivets of a particular length, this device cuts them quickly. By using a slotted plate to hold the rivets, which are fed into the shear steadily, quicker work can be done.—B. E. Dobrée, Battleford, Sask., Canada.



Rivets, Lengths of Small Rod, and Similar Stock can be Cut Quickly with This Homemade Vise Shear

---

¶Especial care must be taken in protecting oak from various kinds of oil used on machinery, as this wood is easily spotted black by the combination of the tannin and products from crude oil.

Pointers on the Care of Auto Tires

Every autoist has his share of tire troubles, which usually start with punctures, and then casing troubles. Half the joys of automobiling can be destroyed if the tires are not properly looked after; so the following hints may be the means of avoiding difficulties and displeasure.

The first rule to be observed is to keep the tires properly pumped up to the pressure specified by the tire manufacturer. A good rule is to make it a point to try the pressure in the tires once a week; a pressure gauge is necessary and should always be carried in the car. Jack up the axle once a week and turn the wheels round and look for cuts, nails, stones, etc., that are likely to injure the casing without causing a puncture. Tacks and nails that have penetrated only the outer rubber may be removed to prevent blow-outs on the road. When a small cut has been made in the casing, it should be vulcanized before dampness or sand has time to work in. Dampness soon rots the fabric, and sand will work in between the fabric and rubber, causing them to separate, and make a boil. Then, undue wear on the rubber is caused and very quick destruction of the tire follows.

There are many gums and fillers sold for filling up cuts in the casings, but vulcanizing is probably the best remedy. Efficient vulcanizers are inexpensive, and convenient for home repairing. If the tire has a bad gash or blow-out, it is best to take it to a vulcanizing shop. The best method to make a temporary repair for a cut or blow-out that has gone through the fabric, is to put an inside blow-out patch inside the casing, being careful to get the edges pinched under the beads of the tire so that the patch will hold in position when the tire is inflated.

Sometimes the fabric of the tire is broken without cutting the rubber. This will cause a blow-out in time, and the only safe way is to ta to the shop and get it repaired a blow-out patch inserted will not last long as the continued friction caused at the break in the casing will crack the patch open. Inner linings help a badly worn casing, but they are a poor substitute for a good vulcanizing job.

The only satisfactory way to repair inner tubes is to vulcanize them, and this may be done in the home garage. Cold patches are desirable in emergencies, but when driving for any length of time on macadam, asphalt, or concrete roads, the tires get very warm, and these patches are likely to loosen up, causing a leak. Vulcanizing all punctures at the first opportunity is the best practice in the long run.

When the hole is larger than an ordinary nail hole, the following method of repairing is good: Cut out a regular-shaped hole in the tube, and scrape the inside of the tube, all around the hole, for ¾ in. on each side. Cut a piece of old inner tube, large enough to allow a margin of ¾ in. around the hole. Apply cement to this on one side, previously cleaned, and also on the inside of the tube. When both are tacky slip the patch into the tube, and see that it adheres well all around the inside of the cut. After preparing the outside in the usual way, the patch may be vulcanized. The patch inside will form a good backing for the soft vulcanizing, and when it is clamped up a perfect weld is made.

If there is a slow leak in a tire, before taking the casings off, test out the air valve by holding a drop of water over it; if air bubbles come out, replace the valve. Dirt is blown into the valve seat, causing a slow leak and much trouble; frequently this is the cause of leakage attributed to a supposed puncture. Summing up, the automobile equipment is not complete without a vulcanizer and material for it, an air-pressure gauge, a blow-out patch, extra air valves, and extra tubes. —F. S. Korbel, Detroit, Mich.

¶A section cut from a cotter pin is useful for replacing buckle tongues.

Apple-Packing Table Mounted on Wheels

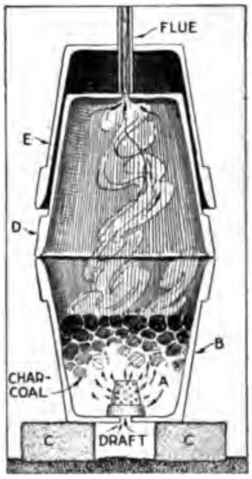
A table for sorting apples to be packed for shipment was made of odd ends of lumber, and mounted on discarded wheels, as shown, making it readily portable. The handiest feature of the rig is a chute from the top, on which the apples are sorted, for culls, leaves, etc., which might get into the barrels. The slats of the table extend lengthwise, and the chute opening is across the top. When the chute opening is wanted wider or narrower, the slats around it are moved.—M. Glen Kirkpatrick, Des Moines, Iowa.

The Table is Moved as Required, and the Culls Placed in the Chute

Fitting a Handle to a Pick

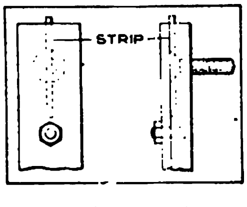
A quick and thorough method of fixing handles in the heads of picks is as follows: Put the head on the handle, as shown, and pound the butt on a solid foundation, until the edge of the pick eye cuts its way nearly to the end. Reverse the handle and pound the other end to loosen the pick. Cut off the slivers, insert the handle in the proper way, and pound the butt on the iron or base to a solid fit. If carefully done, the handles will not loosen even in great changes of weather. — James M. Sherman, Columbia, Mo.

Charcoal Heating Stove Made of Flowerpots



A small stove that was made originally for taking a chill from winter hotbeds, and which can be used for various purposes throughout the year, was made from several clay flowerpots. A small pot, A, was drilled with small holes, as indicated. A 12-in. flowerpot, B, was set on bricks, C, with the small flowerpot inverted over the hole at the bottom. The charcoal fire is made in the flowerpot B, which is covered with a similar pot, D, and over this is another pot, E, which retains the heat. A flue, made of a piece of 1-in. pipe, carries off the smoke and gas. Soft coke may also be used, and the pots will hold heat and fire about 24 hours if pot B is filled three-fourths full.—R. S. Matzen, Fort Collins, Colo.

Device for Holding Screws While Threading Them

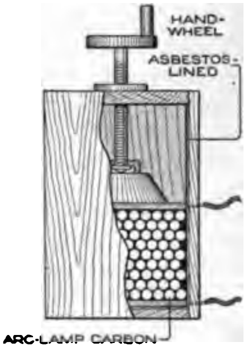


It is often desired to rethread screws which have become burred, and in the tool room many odd sizes of screws are required. It is difficult to hold a screw in a vise while threading it, and the device shown in the sketch was made to overcome this. The screw is inserted in the hole and the small strip of steel in the slot prevents it from turning. A small bolt holds the two pieces of the device together, so that it may be clamped in a vise.

Gauge Determines Diametral Pitch of Gears

The simplicity of this gear-pitch kink, that I have worked out, will appeal to a large number of mechanics, and others who have occasion to send a helper to get the pitch of a gear, in a position where it cannot readily be measured or taken down. Obtain a piece of sheet metal, about .008 in. thick, ½ in. wide, and 3.1416 in. long, and bend it to the circumference of the gear on the pitch line. The teeth between these two points will be the diametral pitch. The explanation is that the diametral pitch is the number of teeth to each inch of the diameter of the gear; therefore, if a gear has, for example, four teeth for an inch of diameter, those four teeth cover a space on the pitch line of 1 in. multiplied by 3.1416, and that is the length of the gauge.—Robert D. McElvany, Norfolk, Virginia.

Rheostat Made from Old Arc-Lamp Carbons



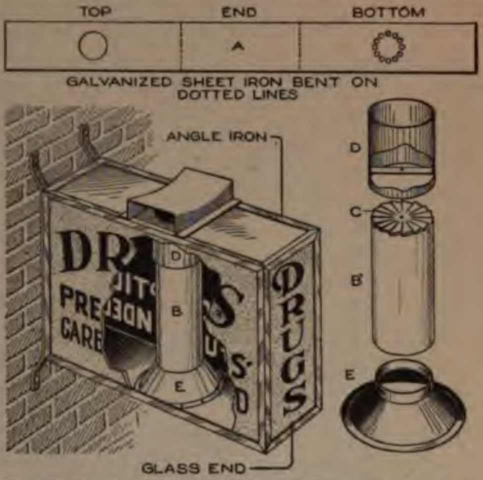
A simple rheostat was made from discarded arc-lamp carbons, as shown in the sketch. A wooden box, 12 in. high and 6 by 6 in. inside, was used as a container, and lined with asbestos, to guard against overheating. A metal plate was fastened to the bottom of the box, and several dozen arc-lamp carbons laid in. The more carbons used, the greater the range of resistance. A second plate was placed on top of the carbon pile. By employing a hand-screw device the pressure on the carbons between the two plates may be varied. When electrical connection is made to the two plates, the resistance varies inversely with the pressure.

An Inexpensive Color-Changing Sign

Color-changing signs are effective as advertising devices, and the box sign shown is so simple in construction and operation that it has a wide use. An angle-iron frame is made up to the desired size. The four corner uprights are riveted to the bottom. The top is fastened to the uprights with screws, to permit its being removed for the insertion of the mechanism and glass sides. The front and two sides are of glass, with the desired advertisement painted on one side of each, and the inner side frosted, to obscure the mechanism. The back, top, and bottom are cut from one piece of galvanized sheet iron, A, with a circular opening cut near one end, and a circle of holes near the other. It is then bent to shape and fastened in place.

The inner mechanism consists of a cylinder of celluloid, B, fastened to a revolving air vane, C, which is made of thin metal, preferably aluminum, with the blades bent at an angle of about 25°. This cylinder is large enough to revolve freely around an upright electric-light bulb. A cylinder of sheet metal, D, is next made, slightly larger in diameter than the celluloid one, and serves as the upper part of the air shaft. A strip of metal is fastened across the inside, and supports the revolving member. The bearing is a glass-head pin inserted in the center of the vane and fastened to the cross strip.

The lower air shaft E is made ½ in. smaller at one end than the celluloid cylinder, and extends 1 in. up into the same. The other end flares out to inclose the air holes in the bottom of the sign. The upper and lower air shafts are then fastened in position, at the galvanized sheet iron which forms the top, bottom, and back. A weather-proof electric-light receptacle is mounted within the lower air shaft, so that the electric bulb will be in the center of the sign. The wires, protected, are led from the socket through a hole in the bottom of the sign, and properly insulated in tubing. A hood, riveted over the circular opening in the top, keeps out the rain. The celluloid cylinder can be painted in broad, vertical stripes with transparent colors. The angle-iron frame is given an oxidized-copper finish by sandpapering in spots, and applying a solution of copper sulphate. This will give only a light deposit, and can be protected with a heavy coat of lacquer or shellac.

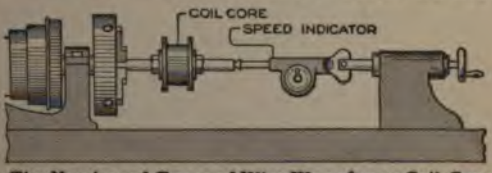


The Draft through the Cylinder Operates the Fan. Various Novel Effects can be Devised Readily for This Homemade Sign

The expense in operating this sign is for the electricity consumed only, as the motive power is furnished by a draft of air formed through the air shafts.—George Niederhoff, St. Louis, Missouri.

Speed Indicator Counts Turns on Wire Coil

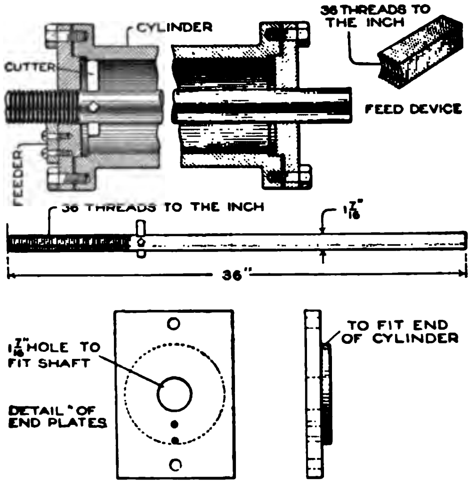
Desiring to rewind a field coil on a form, an electrician placed the form on an arbor and fastened the arbor in the chuck on a lathe. In order to record the number of turns wound on the form, a speed indicator was rigged up as shown. A taper arbor fitting into



The Number of Turns of Wire Wound on a Coil Core was Recorded by the Use of a Speed Indicator the tailstock was notched out to receive the handle of the indicator, and a small pin put through to hold it in place. The tailstock was then run up until the rubber tip of the indicator fitted into the center in the arbor. The number of turns was recorded accurately, and when the wire became crossed, and the form had to be backed up, the indicator automatically subtracted the number of turns unwound. —Earl Pagett, Coffeyville, Kans.

Rigging for Reboring Engine Cylinder by Hand

A high-pressure cylinder on a steam engine was to be bored out, the casting being of such shape and size as to require much rigging to fasten it in a lathe. I bored the cylinder by hand with the arrangement shown, getting a satisfactory job. The boring bar is a shaft of cold-rolled steel, $1\frac{7}{16}$ in. in diameter, threaded as indicated, and fitted with a $\frac{3}{8}$-in. high-speed steel cutter ground like a finishing tool. A $\frac{1}{2}$-in. square, cold-rolled steel, threaded feed device, on the end of the cylinder, engages the boring bar, causing it to move in or out when turned. Plates of steel, as detailed, provide bearings for the shaft, which is fed in by a crank made of a wrench.—Hermann G. Kroeger, Louisville, Ky.



The Engine Cylinder was Bored Out Accurately and Smoothly by Hand

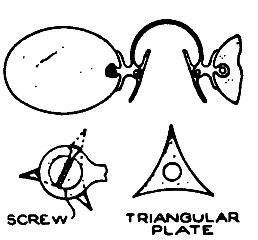
Large Wheelbarrow Saves Time in Cleaning Wood Shop

After watching a man cleaning up shavings and hauling them out in an ordinary wheelbarrow that enabled him to take only about one-third as much material at a trip as he should, I had a large hopper made for his barrow, to permit the hauling of a good load each trip. The hopper was supported by a frame of round iron, 36 in. square at the bottom and widening toward the top. The frame was covered with heavy canvas, and the hopper was lifted from the barrow like a basket when emptying it.—M. C. Webster, St. Louis, Mo.

Wafer Razor-Blade Device for Scraping Paper from Glass

Show windows are often stuck up with posters, playbills, etc., the corners of which are frequently securely pasted to the glass, and removed with difficulty. A tool with which to scrape these off can be made of a wafer razor blade, fastened to a wooden handle. The blade is held by screws, through the holes in the blade, or under the lugs at the end. Kept near the window, this scraper will be found a handy tool.—L. B. Robbins, Attleboro, Mass.

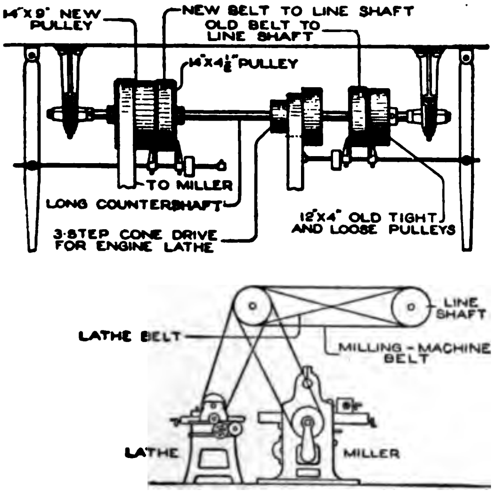
Device Prevents Loosening of Eyeglass Screws



A defect in many eyeglass frames is that the wings which hold the lenses, and through which screws pass, are so thin that the screw soon strips the threads, loosening the lens. A thin, flat piece of suitable metal, three-pointed, as shown, provides a remedy. It is placed beneath the wing, and after the screw is driven home, the points are turned over, one of them in the slot in the screw head, preventing the screw from turning. In tightening the screw, the point is raised. This device on a pair of glasses has prevented the slightest turn of the screw for over a year.—J. S. Zerbe, Coytesville, N. J.

Double-Drive Countershaft Arrangement

On a rush order, floor space was at a premium, and a milling machine had to be set beside a lathe, in constant use. To get the miller going in good time, and with little expense, I put up a double-drive arrangement. After figuring the pulley diameters, for the required speeds, two 14-in. pulleys, one 9 in. and the other 4½ in. wide, with set collars were mounted on the countershaft. Both of these pulleys are loose on the shaft, and held in position by the collars. The drive belt from the line shaft runs on the 4½-in. pulley when the miller is not running, and is shifted over on the 9-in. pulley when the machine is started. This drive has given no trouble, and does not interfere with the running of the lathe.—Joe V. Romig, Allentown, Pa.

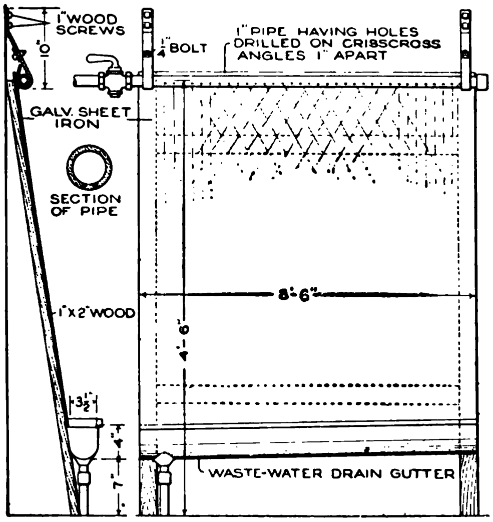


An Old Lathe and the Newly Installed Miller were Driven from the Same Countershaft

¶Circular areas of crosshatching, scratched into triangles near their corners, prevent them from slipping too easily on the drafting board.

Washing Rack for Blueprints

In using this blueprint-washing rack the prints are spread over the galvanized-iron surface, which is first sprayed with water, causing the paper to adhere. The water is then turned on as desired, and the paper sprayed until it is thoroughly developed. The water is turned off, the paper is removed, and placed on the drying line. The water-supply pipe is supported by strap-iron brackets, and the washing surface is built over a wooden frame, as indicated. A galvanized-iron drain gutter carries away the excess water.—J. M. Morse, Brooklyn, N. Y.



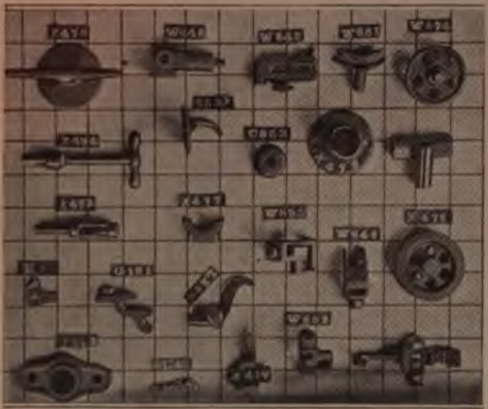
The Blueprints are Spread on the Moistened Surface and Washed Until Developed

Clip Holds Door of Terminal Boxes during Tests

A kink that I have found very handy while working in electrical-terminal and test boxes is the use of a clip for holding the door open, especially in a breeze. It is extremely annoying to have a door of a test box blow shut unexpectedly. This simple holder, which is made somewhat like a large clothespin, slips over the upper or lower edge of the terminal box near the hinge edge of the door, and is set in front of the door, holding it open.—A. Gemmill, Ansonia, Conn.

Size of Objects Photographed Indicated by Background

When making photographs of small objects for catalogs and similar purposes, divide the background into squares of equal dimensions, and the size of the objects photographed can be estimated readily in the picture. In the photograph of some small patterns, the copy board was divided into 2-in. squares, by means of black strings stretched tightly from brads driven at intervals on the edge of the board.—R. D. Stevens, Lawrence, Mass.



The Sizes of These Patterns can be Estimated by Comparison with the Two-Inch Squares in the Background

Raising Shop Desk Increases Its Usefulness

The man in the shop office usually does not care to sit down to write an occasional order or note, and a desk with a chest-high writing surface saves his time. The photograph reproduced shows a raised desk used by a shipping clerk. The arrangement also enables him to get paper, tags, etc., from any of the drawers without undue stooping.

Suggestions on Automobile-Tire Economy

In extremely hot weather it is better to start out with automobile tires a trifle slack rather than pumped up too hard. The heat of running will increase the air pressure several pounds. Never run a tire which shows any pronounced "give" when the car is rocked by hand. The moment the car shows an unusual tendency to swerve, or steers hard, stop and make sure that a puncture is not the cause.

High, Portable Lamp Standard for Shop Lighting

Unless the illumination of a shop is unusually well planned, it will be necessary to employ local lighting at night, and on dark days. The use of the portable lamp standard, shown in the illustration, has been adopted in a large shop. It consists of a gas-pipe standard, 12 ft. long, screwed into a heavy cast-iron base. A high-candlepower, nitrogen-filled lamp is used, providing plenty of light for accurate shop work. The lamp is moved to the work, rather than the work to the light, and suitable electrical connections made.—C. M. Hall, St. Louis, Missouri.

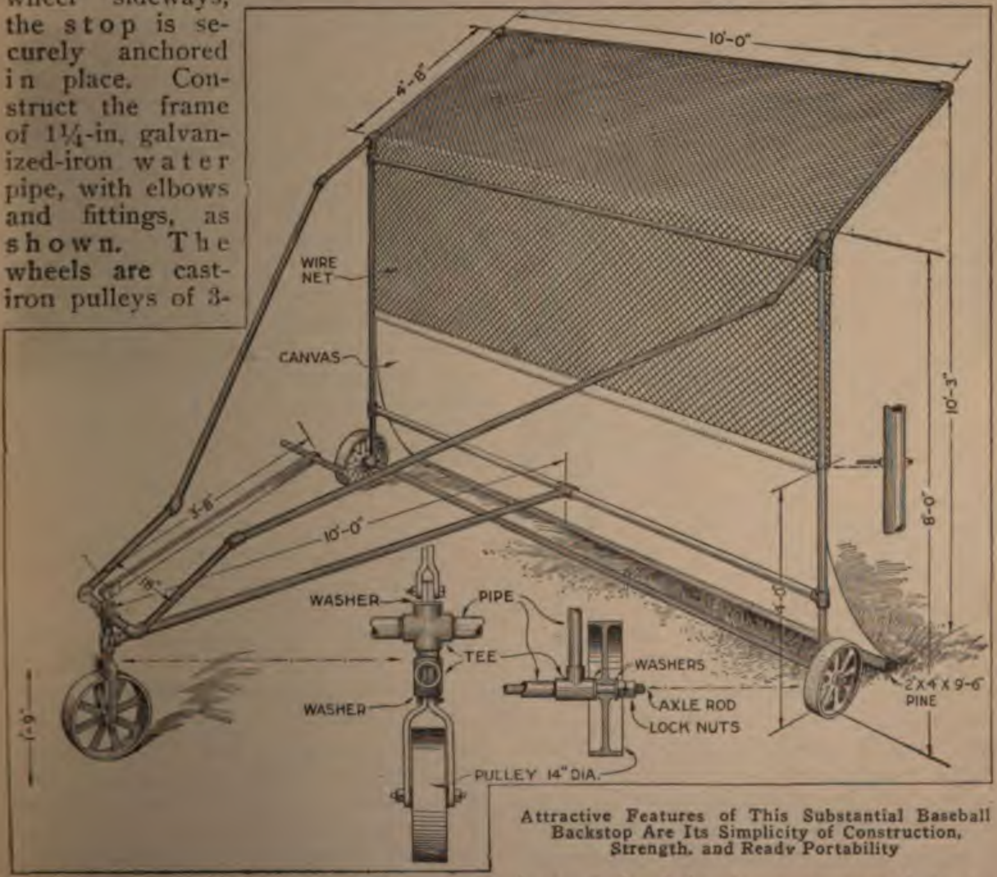
Preventing Typewriter Platens from Becoming Grooved

By using the variable line spacer frequently on a typewriter, or moving the platen slightly from its previous position, the entire surface of the platen is written over, thus preventing its becoming deeply grooved, as occurs when line after line is written, day after day, over the same point on the platen.—John M. Bonbright, Philadelphia, Pa.

A Portable Baseball Backstop Built of Pipe and Wire Netting

By P. P. AVERY

INSTEAD of the common makeshifts, a substantial portable baseball backstop was installed by a ball club, and proved popular and very practical. It may be wheeled to various positions and even transported to a distant field. By turning the front wheel sideways, the stop is securely anchored in place. Construct the frame of 1¼-in. galvanized-iron water pipe, with elbows and fittings, as shown. The wheels are cast-iron pulleys of 3-in. face, secured to the bottom cross member, as detailed. Secure the steering wheel by a fork made of ½ by 1½-in. band iron, bent to shape, as shown, and for a bearing use a heavy washer. The top part of the fork is rounded and riveted together to pass through the pipe connections. Drill a ½-in. hole at the top and fasten the fork to the handle, of ⅜ by 1¼-in. iron, 3 ft. 8 in. long, arranged to be swung back when not in use.



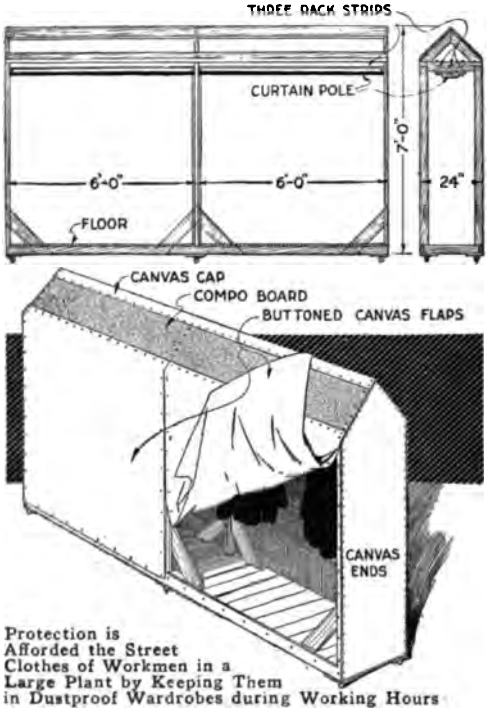
Attractive Features of This Substantial Baseball Backstop Are Its Simplicity of Construction, Strength, and Ready Portability

A net of heavy galvanized-wire mesh

is stretched over the main frame, and heavy duck, or canvas, is fitted over the lower section. Secure the wire mesh by heavy galvanized-iron wire wrapped around the pipe. The canvas is secured by lapping it over and sewing it. A basket may be slung under the lower front rod, in which baseballs, bats, gloves, etc., may be carried.

Canvas-Covered Wardrobe Protects Workmen's Clothes

Considerable dust collects on the clothes of workmen and employes in shops and workrooms in spite of precautions unless a covered inclosure is provided for them. In a large manufacturing establishment, wardrobes like that shown in the illustration are provided for this purpose. Each employe has a numbered clothes hanger and a portion of a hat rack above its place on the curtain pole, as shown. The clothes are placed in the wardrobe as the employes report for work, and ordinarily not removed until the hour. The framework for the wardrobe is built up of 2 by 4-in. stuff, strongly braced. The hat rack is made of three strips set under the gable. The curtain pole is supported by wooden blocks, bolted into place. The dimensions shown may be varied to suit special needs. The frame is set on casters and can be moved handily. The gable is covered with compo board and the sides and ends with canvas. The side curtains are buttoned securely into place when the clothes are placed in the wardrobe.—Charles M. Petersen, Buffalo, N. Y.



Protection is Afforded the Street Clothes of Workmen in a Large Plant by Keeping Them in Dustproof Wardrobes during Working Hours

Typewriting on Tracing Paper for Blueprint Reproduction

In making duplicate copies of manuscripts having inset illustrations, or in reproducing specifications, the blueprint process is often the most convenient. To letter a considerable quantity of text is tedious, and, if properly done on a typewriter, the result will be more satisfactory. Tracing cloth, or tracing paper, preferably of the unglazed onion-skin variety, may be used. In writing the text on the typewriter, reverse a piece of carbon paper under the tracing paper, so that the impression is made on both sides of the sheet. This will give density, and make the blueprints sharp. If white prints with dark lines are desired, a new sheet of carbon paper should be used, and this taken as the negative in making the prints.

Enlarging Cylinder Fins Aids in Cooling Engine

Repeated overheating of the cylinders of an air-cooled gasoline motor led to experimenting in an effort to prevent this trouble. The result was the fitting of disks, or split rings, of sheet copper, around the cylinder, between the smaller fins cast on the cylinder. The rings were bolted into place, becoming practically a unit with the cylinder. The heat is radiated rapidly, and the cylinder is kept cool in spite of heavy running of the motor.

A Traveling Crane for the Farm

On a large farm, operated with heavy traction engines and other machinery, a method of moving or lifting heavy weights is often necessary. This traveling crane is on a farm at Williams, Calif., and pays for its cost every year in time saved in making repairs or doing other heavy work. The construction can be simplified greatly, to fit the needs of smaller farms, where only a small range is necessary.

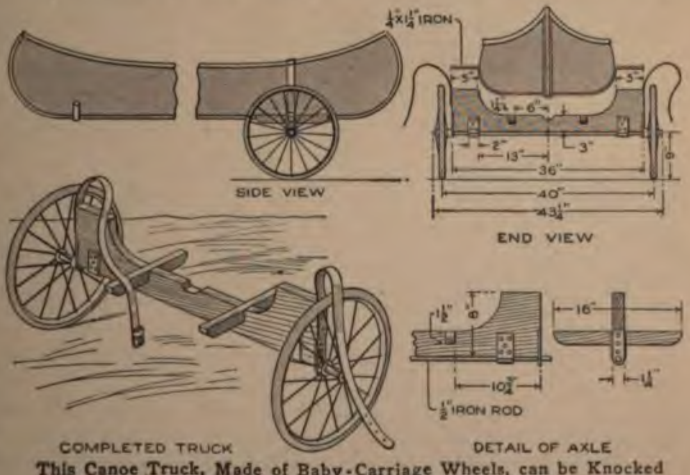
The supporting structure is of heavy timber, made in standard braced construction, with posts securely set into the ground. The horizontal beams carry steel rails, on which the carriage rides. It is drawn along by a rope arrangement, which extends, through pulleys, to both ends of the framework, making it easy to move the carriage and load by drawing on the proper rope. The ends of the rails are guarded to prevent the carriage from rolling off. The carriage consists of a cross I-beam, braced to two wooden supports, in each of which two flanged wheels are mounted. These engage the steel rails. The load is supported from the I-beam by a differential pulley, or other tackle. The tackle should be suspended from a trolley, which rides along the I-beam.

When the Farmer or an Employe Is a Trained Mechanic, Even Heavy Machine Work can be Done on the Farm with the Aid of a Crane

A Truck for a Canoe or Small Boat

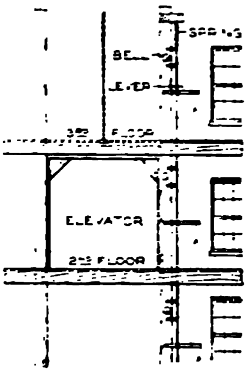
A canoe must frequently be carried over a trail, or other place, and this work is made convenient by the use of a small truck made of two rubber-tired baby-carriage wheels, suitably mounted. A piece of ½-in. iron rod is used for the axle, as shown. An old trunk strap, two iron clamps, two small wooden brackets, and a carrying handle of ¼ by 1¼-in. band iron are the fittings used.

To make the truck, cut the main piece of 1¼-in. oak, and outline the lower section of the canoe on it, as shown. Make the cross brackets, used to keep the truck steady, and fasten them with screws. Fit the axle into a groove under the main piece, and attach it by clamps, as shown. Secure the wheels with washers and cotter pins. Attach heavy trunk straps at the ends. To use the truck, set the canoe in place, and buckle the strap around it, as shown. The iron carrying handle is placed under the opposite end. The entire outfit can be carried, knocked down, in the canoe. —J. A. Downs, San Francisco, Calif.



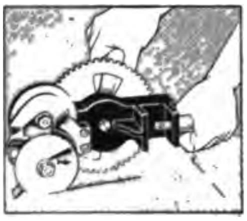
This Canoe Truck, Made of Baby-Carriage Wheels, can be Knocked Down and Carried Handily in the Craft

Gong Warning System for Freight Elevator



A simple mechanical safety device that will give returns in the way of immunity from freight-elevator accidents can be rigged out quickly. Gongs are fitted to the frame of the elevator, at each floor, 6 ft. above it, with the handles below the bells. On the top floor, a coil spring is arranged which pulls the connecting rods back to the original position after use. A conspicuous card near each handle reads: "Ring Bell before Using Elevator." The bells are the usual trip-gong pattern. The pull rods and handles are of flat stock, iron or soft steel, $^3/_{16}$ by $^3/_4$ in. Round stock can also be used, but requires more work to make the proper connecting joints. The use of jam nuts makes a better job.—S. A. Seipel, Indianapolis, Ind.

Cutting Floor Openings with Hand Circular Saw

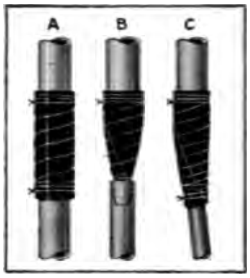


In removing a few sections of flooring to install pipe or wiring, a handy way of cutting the boards, especially across the grain, is to use a small circular saw. This can be mounted on the spindle of a hand emery grinder, as shown. A handle should be fitted to the frame of the grinder, to steady it, and a projection added to rest on the floor and aid in gauging the depth of the cut. An old plane blade is useful in cutting the tongue from the flooring.—E. C. Galbreath, Denver, Colo.

Wire across Lamp Relights Acetylene Flame

Thin piano wire placed slightly above and at right angles to the acetylene flame of an automobile tail lamp has been found efficient in preventing the light from going out without the knowledge of the driver. The wire becomes incandescent, and reignites the gas when the flame is jolted or blown out. The wire should be drawn taut, so that it is continually in the flame.

Roofing Paper as Emergency Pipe Connection



A quick, cheap, and satisfactory connection for pipes, to carry liquids not under pressure, can be made from a piece of one-ply roofing paper. Roll the paper into a tube of double thickness, as indicated at A, and tie it into place with wire or cord. Pipes of different sizes can be joined in this way by the methods suggested at B and C. Pipes that are out of line can thus be connected, as shown at C, and by using heavy paper, and more thicknesses, a connection can be made that will stand being left underground for some time. —Henry Simon, Laguna Beach, Calif.

A Tough Cement for Pipe Joints

A cement which has stood the action of 60 lb. of steam, in a pipe connection where rubber glands and white lead had failed, is made of 10 parts of fine iron filings, and 3 parts of chloride of lime, with water added to form a paste. So tough is this cement, that when two joints of 3-in. cast-iron pipe, which had been secured with it and left one night, were broken apart, the cement scaled off a portion of the iron flange of one of them. The cement is applied in the usual manner.—W. S. Standiford, Youngstown, Ohio.

uipping Buildings with Lightning Protection

by Terrell Croft

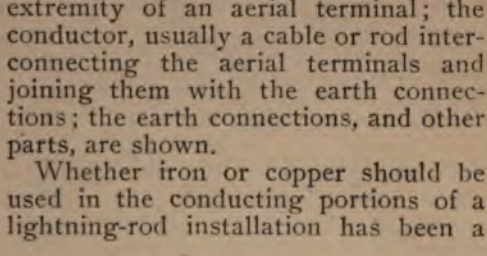
GHTNING destroys about $10,000,000 worth of property an-
y in the United States, largely on
s. The United States Bureau of
dards estimates that the yearly
is about $8,000,000, but it is prob-
that this is a conservative valua-
Now, it can be shown from un-
d statistics that buildings prop-
and scientifically equipped with
ning protection are seldom, if ever,
ged. Reliable statistics indicate
lightning rods, even as they are
arily installed—and they are not
ys arranged most effectively—pre-
at least 90 per cent of the possible
ning damage. Lightning rods, so
Bureau of Standards report asserts,
e fire hazard from lightning as
as 99 per cent, in the case of
. Every individual who owns, or
ts to own, property, will find some
ical knowledge on this subject
ble, as set forth briefly in this
e.

ntrary to general impression, to
ll lightning rodding so that it
be most effective requires special
ledge, and experience. Any light-
rodding placed on a structure,
ded one end is connected with the
nd, affords some protection, but
im is to obtain maximum protec-
with material purchased at reason-
expense.

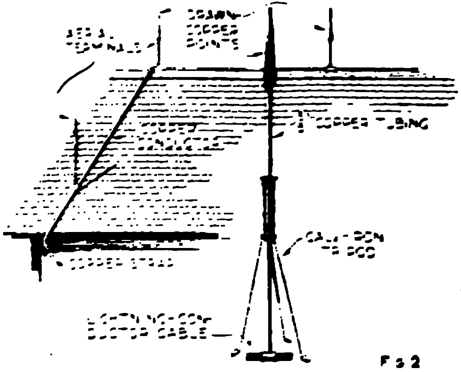
dern lightning-rod practice is
ly the result of practical expe-
e, because it is seemingly impos-
to duplicate in the laboratory the
l conditions of, and the enormous
rical quantities involved in, a
ning flash. In the appliances for,
n the arrangement of, a lightning-
nstallation, simplicity is desirable,
mechanical considerations are almost, if not quite, as important as the electrical features.

Some of the terms used are indicated graphically in Figs. 1 and 2. An aerial terminal, a point constituting the upper extremity of an aerial terminal; the conductor, usually a cable or rod interconnecting the aerial terminals and joining them with the earth connections; the earth connections, and other parts, are shown.

Whether iron or copper should be used in the conducting portions of a lightning-rod installation has been a much-debated question, and both sides are partly right. In the light of experience to date, the situation sizes up as follows: Electrically, one may be as good as the other. With either metal, there must be sufficient material



Installation of Lightning Protection on a Small Cottage, the Various Essential Features being Designated



F 2

Details of a Roof Installation with Short Aerial Terminals, and a Typical Larger Aerial Terminal

[illegible] the lightning conductor—and in the other [illegible] of the system that may carry current at the instant of a flash—to insure that they will not melt. Because of the fact that iron is a poorer conductor of electricity than copper, it is necessary, from an electrical standpoint, to use a heavier conductor if it is made of iron than if it is of copper. Copper withstands the action of the weather much better than does commercial iron or steel, and has, under practically all conditions, an almost indefinite life. Commercial iron and steel have, relatively speaking, short lives. In certain instances, where iron lightning rods have been installed in dry climates, or where the air is pure, or where they have been kept painted, they have often lasted for many years. From the standpoint of temporary protection it makes little difference which metal is used for the rodding, provided there is enough of it. An iron-rod installation, correctly disposed, will afford much more effective protection while it lasts than will a copper-rod installation applied without regard to the physical facts. Furthermore, flimsy, light-weight, copper-cable conductor comprising very small diameter wires is probably not as good as a heavy-wire conductor because the frail copper is likely to be broken mechanically. It is possible that, with these conditions, the iron would last longer than the copper.

Copperplated or copper-sheathed iron lightning rods and fittings can be distinguished easily from solid copper, but unless one is familiar with the characteristics of metals, the deception may be difficult to detect by superficial inspection. Test the material by its attraction for a small permanent magnet, which will not attract any of the common metals except iron and steel. If the magnet tends to stick to the metal, which appears to be copper or brass, it is evidence that a copper or brass coating is concealing an iron core. The magnet will attract through the deceptive plated-copper, or sheet-copper sheath.

Should or should not the lightning rodding be insulated from a building is answered fairly by this fact: Only a few of the manufacturers of lightning-rod material now recommend and furnish insulators for the rodding. From a physical standpoint, it is undesirable to insulate the rodding from a building, and a great majority of the reliable lightning-rod manufacturers discontinued the use of insulators long ago. However, it is probable that the diminutive insulators, as installed, are almost ineffective as insulators, particularly when they are dirty or moist. These are in certain cases the cause of inductive "side flashes," because they may prevent all parts and the contents of the building from rapidly attaining the same electrical potential as that of the lightning-rod system.

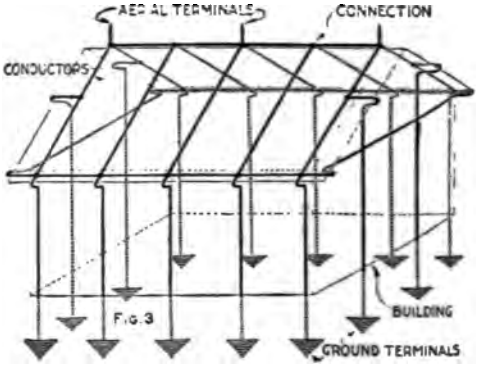
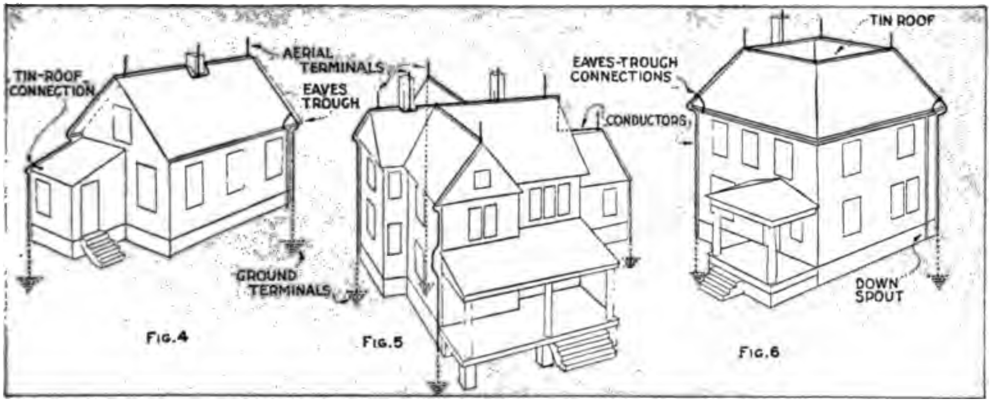


FIG. 3

An Ideal Lightning-Conductor Installation, the Structure being Completely Caged



Typical Installation on Various Residential Buildings, the Aim of Maximum Protection with a Minimum of Material being Carried Out Reasonably

The ideal lightning-rod installation would be a metallic cage surrounding the structure. The cage should be electrically connected to the earth and surmounted with metallic points, as shown in Fig. 3. In practice, installations are not made in this way, except where powder magazines, oil tanks, and similar structures, are to be protected. Cheaper methods provide protection which, though possibly not quite so effective, experience has shown to be adequate. The practical problem in arranging protection for a building is so to dispose the minimum amount of material that maximum protection will be afforded by it, and so that it will approximate the ideal grounded-cage arrangement of Fig. 3. Figures 4, 5, and 6 illustrate examples of typical installations.

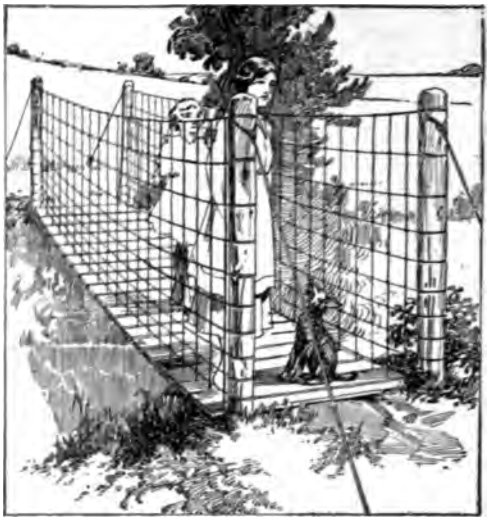
The conductor should preferably be of copper. It may be round, flat, tubular, or of star section, and solid or woven from wire strands, provided it possesses sufficient mechanical strength, and conductivity. Since stranded cable is mechanically more desirable than a tubular arrangement, it probably presents the best form of lightning conductor. There is no valid practical objection to a solid conductor, except that it is difficult to handle and to install. It must ordinarily be manufactured and shipped in relatively short lengths, which are joined on the job to form the complete conductor. Joints are undesirable, if they can be avoided. If a stranded conductor is used, no strands should be smaller than .04 in. in diameter. If the strand wires are too small, they will be mechanically weak. There is no reason to believe that "lightning travels in a spiral"; hence, twisted conductors have no advantages, on this ground, over untwisted ones.

In attaching the conductor to the building it should preferably be held thereto with clips of the same metal as that of the conductor. If dissimilar metals are permitted in contact, this may, under certain conditions, cause an electrolytic action between them, which will eat away one of the metals, at the point of their contact. Copper straps, similar to pipe straps, are ordinarily utilized for supporting round cable conductors. Specially designed fasteners are used where the conductor is not of circular cross section. As a general proposition, the conductor should be supported at least every 5 ft. in vertical runs, and every 2½ ft. in horizontal runs. A conductor should never be supported with nails driven through it, or driven in at one side and bent over, particularly if it is of cable form. Such treatment will certainly sever some of the strands.

¶The tendency of varnish to "crawl" on the second coat, in cold weather, may be overcome by applying benzine on the first coat, permitting it to dry before applying the second coat.

A Novel Footbridge of Woven Wire

Spanning a small stream on a farm in Missouri is a novel footbridge which a farmer constructed out of woven wire supported on heavy fence posts. The bridge will support a load of several persons, but is ordinarily used only for one person at a time. Strong woven-wire fencing was stretched across the stream on posts, set 3 ft. apart and strongly braced with anchored wires. Six-inch boards, 1 in. thick, were fastened on the second horizontal strand of the fencing, and the boards further supported by lacing wire around them, and attaching it at the same time to the several lower horizontal strands of wire, as a safety feature.—George M. Petersen, Buffalo, New York.


A Practical Bridge for a Small Stream on a Farm was Made by Supporting the Footboards on Woven-Wire Fencing

Spark Plugs Cleaned with Bag of Shot

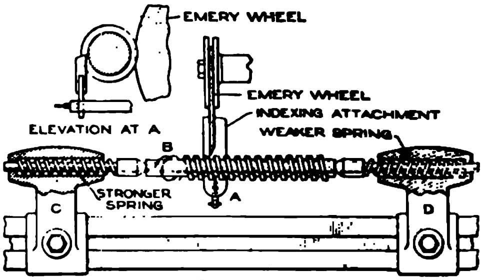
A small cloth bag filled with fine lead shot can be carried in the tool chest of an auto without trouble and is of great assistance in cleaning spark plugs. After placing a few drops of gasoline on the plug, the mouth of the bag is tied around the plug body by means of the tie strings. By taking the plug between the fingers and shaking it up and down a few moments the carbon deposit is removed. The shot does not scratch the glaze on the porcelain, or injure its insulating properties. It may be used repeatedly.—Thomas W. Benson, Philadelphia, Pa.

Rigging for Grinding Screw Threads

Grinding of hardened screws, worms, etc., such as are used in talking machines, sewing machines, and ordnance work, was done by cutting the thread, hardening the work, and straightening it on centers. This method was slow, costly, and inaccurate. The method shown is now in daily use in a large shop, and is very satisfactory.

Of the two spring centers, C and D, the tail center D has a helical spring of about one-half the strength of the spring in the headstock C, and the function of this weaker spring is to keep the centers in place, while the spring in C holds the thread against the flat spring A. These centers and springs fit accurately in the bores of the head and tailstocks, with no lateral play.

The indexing attachment is clamped to the head of the grinder, and the flat spring, at A, is set so that when a point in the thread being ground passes the emery wheel, it reaches the flat spring as soon as possible. The screw to be ground is turned by hand, and as it is turned in the direction of the arrow B, the screw is moved in the direction of the tailstock, the stronger spring in C compressing the weaker spring in D, and the cut of the emery



The Emery Wheel Grinds the Threads as the Screw is Turned by Hand wheel is regulated by the flat spring at A.

This method has many applications in taper and spiral dividing-head work, and in some cases where a dividing head is useless, the work may be readily done.—J. B. Murphy, Plainfield, N. J.

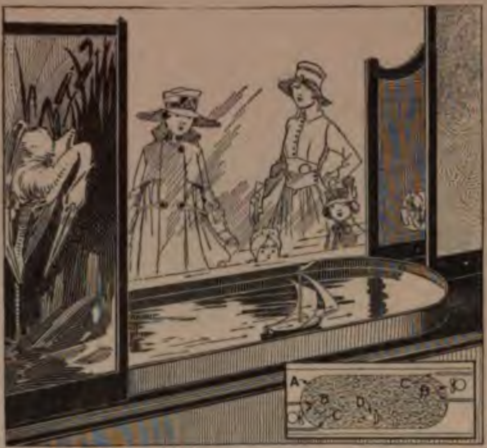
Sanitary Shields for Shop Cuspidors

In a large shop, where numerous cuspidors were provided, the floors and walls around them soon became insanitary, and it was decided to provide a standard type of cuspidor and a shield that would overcome this objectionable feature. Enameled basins filled with sand were used, and a shield of sheet metal to fit over the basin was devised. One hundred of these were made cheaply and distributed about the shop. They are easily cleaned with water from a hose, and the results were much better from a sanitary as well as a practical standpoint.—Alfred J. Bell, Detroit, Mich.

Sanitation was Promoted in a Large Shop by the Use of Many Cuspidors Provided with Metal Shields

Mystery Sailing Ship as Window Display

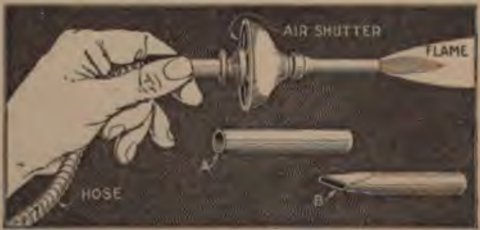
Devices which excite the curiosity of spectators are often useful as window displays, and it is on this basis that the mystery sailing ship keeps a crowd before a window in which it is displayed. A small wooden ship with sails is placed in a tank, which has rounded ends and is partly filled with water. The ship D sails around the tank A, as indicated in the diagram, because of the draft from two fans, B, hidden behind screens C. When the ship is forced to the end of the tank, the draft from the fan at that end strikes the sails, shifting them, and driving the craft to the opposite end, where this process is repeated.—R. S. Matzen, Fort Collins, Colo.



The Ship Sails around the Tank and the Onlookers Are Curious to Learn What Keeps It Moving

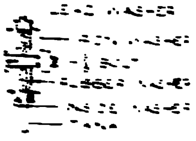
Gas-Mantle Fixture Used as a Blowtorch

The portion of a gas-mantle fixture having an air shutter can easily be made into a Bunsen burner, or a blowtorch of considerable force, by flattening the round end A into the form shown at B. The fixture is attached to a gas hose, and the air shutter regulated to produce a sharp blue flame with the desired pressure. This simple arrangement is often useful where a Bunsen burner of the ordinary type, having a base, is not practical.—M. J. Doyle, Cleveland, Ohio.



The Mantle Fixture was Quickly Converted into an Effective Bunsen Burner, with a Blowtorch Action, by Flattening the End of the Tube

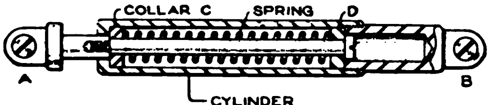
[illegible] Small Water Tank



[illegible] washers were [illegible] the entire set [illegible] family, with a [illegible] washers were [illegible] ing, compressing [illegible] forming a tight packing.—Fred W. Page, Winfield, Kans.

Compression Coil Spring with Double-Action Case

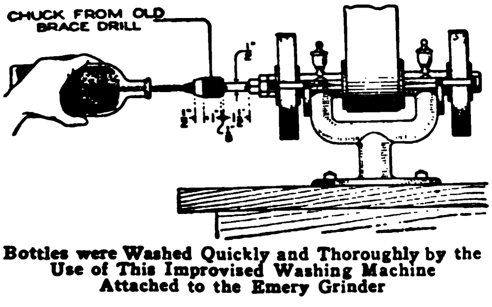
An arrangement of a coil spring in a case so that the spring will be compressed both when the points of fastening, A and B, are brought farther apart and closer together is useful on doors and on many mechanical devices. A typical housing of a coil spring in a case, such as would be suitable for a door, is shown in the illustration, which is a longitudinal sectional view. When the points A and B are brought closer together, the collar C acts on the spring, compressing it against the collar D, and the bolt head slides in its pocket. When they are brought farther apart, the collar D compresses the spring against the collar C, bearing on the end of the cylinder.—George M. McGinley, Woonsocket, R. I.



The Feature of This Device Is That the Spring is Compressed When the Distance between the Points of Fastening is Extended or Shortened

Chuck on Emery Grinder Used for Washing Bottles

In a shop and laboratory, an emery grinder was rigged to provide a handy power bottle-washing machine, by mounting a chuck from an old drill on one end of the grinder spindle. The chuck was set on a ½-in. rod, and this was threaded into the spindle. The bottle brush was gripped in the chuck and the bottles slipped over it, and held in the hand as shown.—P. F. Jamison, Chicago, Ill.


CHUCK FROM OLD BRACE DRILL

Bottles were Washed Quickly and Thoroughly by the Use of This Improvised Washing Machine Attached to the Emery Grinder

Pockets on Switchboards for Memos of Special Calls

The traffic manager of a telephone exchange handling a large number of long-distance messages found that his operators lost considerable time in keeping track of their ticket records of toll calls that could not be completed immediately. To keep the "delayed" tickets constantly before the operators, pockets were constructed along the top face of the switchboard, each pocket marked with the code letters showing the reason for the delay in handling the message, as UDLW: "Party called for is out; left word for him to call." The pockets were made of light tin, painted dull black, and lettered in white. The scheme is very successful in speeding up the service, keeping delayed call tickets in sight of both the operators and the chief operator in charge.—E. C. Blomeyer, Waco, Tex.

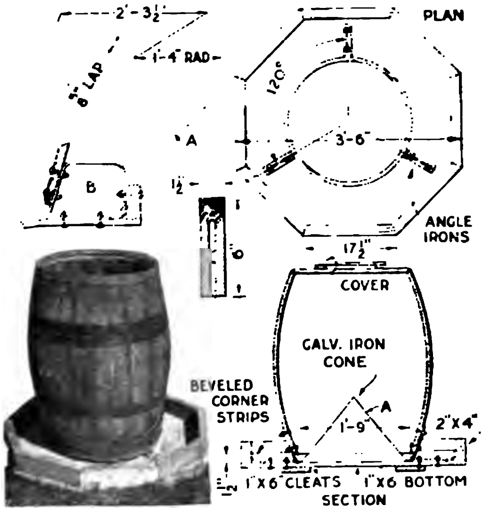
Telephone Service was Improved by Providing a Code File for Delayed Toll Calls

Soldering Wrought-Iron Rings by Dipping Saves Time

Certain kinds of machinery require the use of wrought-iron rings, made of cylindrical bar iron of small diameter. It is common practice to solder together the ends of these rings by the use of a soldering iron. When a large quantity of these rings were made at one time, it was found more economical to substitute a dipping process. After the ring is formed, the ends are dipped into a pan of molten solder. This method reduced the soldering time 50 per cent.—Joseph Plogmann, Cincinnati, Ohio.

A Swine Cafeteria in a Barrel

To make this "help yourself" eating house for swine, which was built at the Minnesota Agricultural College at a



The Construction Is Simple, and the Barrel can be Adjusted Quickly to Increase the Quantity Fed

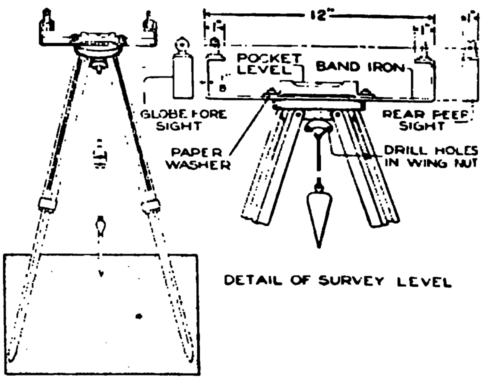
cost of $6.50, including labor, obtain an empty barrel, some boards, nails, a piece of sheet iron, and some strap-iron angles. The barrel is supported slightly above the platform, and the grain, or tankage, feeds out around the lower end, from the sheet-iron cone A. Angle irons, as detailed, keep the barrel in position. Two slots permit

Twelve Shoats or Six Full-Grown Hogs are Accommodated by This Self-Feeder

the supports to be slipped out far enough to clear the bolts in the barrel, for easy adjustment of the latter. The trough and platform are made of 1-in. lumber, and the rim is of 2 by 4-in. pieces. Guards may be attached to keep the pigs from rooting out the feed, as detailed at B. This outfit accommodates 12 shoats or six full-grown animals, at a time. The barrel feeder is cheap and simple in construction, and its durability is limited only by the material used for the trough.—E. R. McIntyre, Madison, Wis.

Builder's Survey Level with Sights from Old Rifle

This homemade arrangement provides a means of ascertaining true levels on buildings, floors, stone foundations, etc., and is made of materials easily obtainable. Make a tripod, using the top plate and the attaching wing nut from an old camera, if possible. Band iron is bent, as shown, and on the top arms an old pair of rifle sights are soldered in place, taking care to get them very accurate. Fix a pocket glass level, about 4 in. long, on the direct center of the iron bracket, by the use of two ordinary carpenter's squares. The level in its level position must be absolutely parallel with a line through the peep-sight centers. Insert small paper washers under the pocket-level clamps, and after the sights are soldered to the top ends of the bracket, it will be easy to obtain an accurate parallel. Three



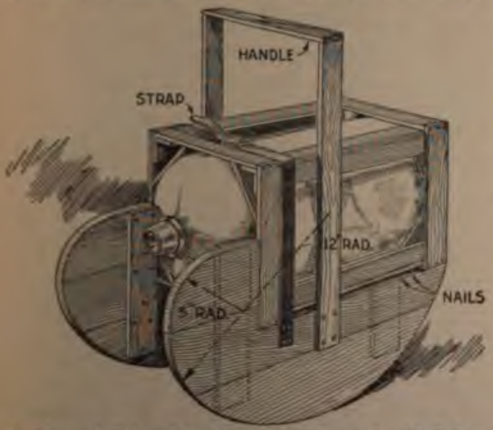
A Serviceable Survey Level, Made at Small Cost, Which Gives Accurate Results holes are drilled in the iron level bracket, the center one tapped for the camera-tripod thumbscrew, by which the tripod is fastened to the level bracket. The other holes are for securing the pocket level. Old rifle sights are easily obtainable at a locksmith's shop. The plumb bob is suspended as shown.

A Wire-Gauze Stencil

A good background stencil can be made by attaching letters and figures to wire gauze, the color being applied over the lettering, producing a background of the desired color. This stencil is flexible, making it useful on irregular surfaces.

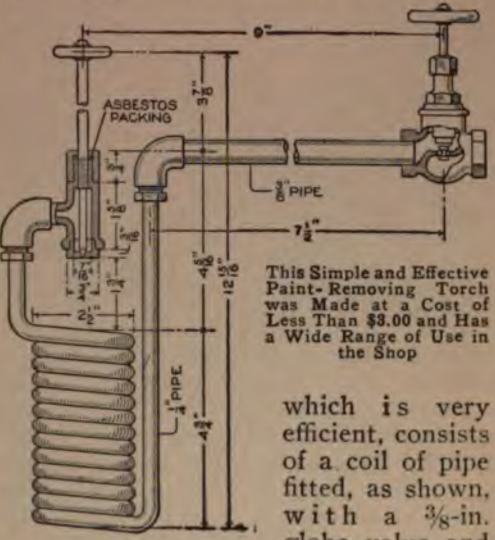
A Tipping Cradle for Carboys

Large bottles or carboys cannot be handled safely while pouring out the contents by tipping, because of their weight and shape. The arrangement shown is built of wood, and makes the handling of carboys safe and convenient. The carboy is placed on the two rockers; the frame of the carboy is gripped by small nails, which protrude ¼ in. from the upper edges of the rockers. A strip nailed to the sides of the rockers holds the carboy from slipping from the cradle. The handle gives a good hold in tipping the device.—John E. Cahill, Jr., New York, N. Y.



Acids and Other Liquids may be Poured with Safety by the Use of This Carboy Rocker

Torch for Burning Off Old Paint



This Simple and Effective Paint-Removing Torch was Made at a Cost of Less Than $3.00 and Has a Wide Range of Use in the Shop

A device for burning old paint, or enamel, from automobiles, carriages, passenger cars, locomotive cabs, etc., which is very efficient, consists of a coil of pipe fitted, as shown, with a ⅜-in. globe valve and other parts. Gas can be used with it, or a reservoir filled with oil and connected by hose to an air line, which forces the oil out through another hose connected to the ⅜-in. globe valve, can be utilized. The globe valve regulates mainly the flow of the oil, and the needle valve controls the size of the flame.

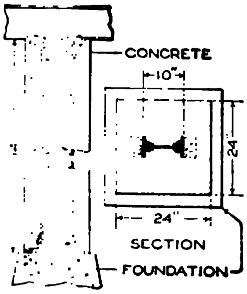
The user holds the device in one hand, and goes over the painted surface, keeping the torch moving slowly, and then holding the burner away, while he removes the burnt paint with a scraper held in the other hand. In using oil, the coil serves a twofold purpose, helping confine the flame to a proper area, and the flame passing inside the coil heats the oil being forced through it to a high temperature by the time it gets to the burner, thus preparing it for combustion.—Joseph K. Long, Renovo, Pa.

¶Concrete that collects on a mixing machine can be removed easily if a heavy coat of grease is applied to the surfaces where the concrete collects before the mixer is put into operation.

Safety Mirror Attached to Automobile Mudguard

A novel way of mounting traffic mirrors on automobiles, instead of the usual position at the side of the windshield, is on the mudguard of the front wheel, facing the driver, using only ordinary pipe fittings. A crowfoot, or flange, is attached to the back of the mirror, into which is fastened an ell and straight piece of $\frac{1}{4}$-in. pipe, long enough to extend a few inches below the mirror. A crowfoot is also fastened to the mudguard. The mirror frame and fittings are painted the same color as the car. A better view of what is going on back of the machine is obtained by the mirror in this position.—Harry Slosower, Pittsburgh, Pa.

Old Steel Columns Reinforced by Concrete Casing

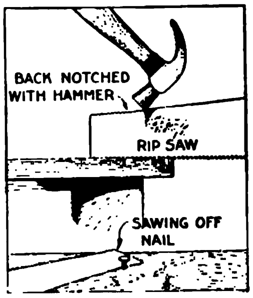


Structural-steel columns, that are rusted to such an extent that further painting is both inadvisable and ineffective, may be kept in a good state of preservation and be strengthened as well by incasing them in concrete, as shown. This system is applicable to many types of columns, and if the concrete is carried to the top, it really becomes a reinforced-concrete column, the steel furnishing the reinforcing for the concrete. Such work has the further advantage of being possible to construct without removing the column from the load it is supporting.—H. P. Roy, sas City, Mo.

White Opal Glass Useful for Headlights

An excellent headlight lens that eliminates the glare, gives an ample amount of light when the lights are dimmed, causes no perceptible loss of light on the road in front, while giving more light on the sides of the road and being easy to keep clean, can be provided by using panes of white opal glass cut to the required size. It costs a little more than paper dimmers, but much less than patented lenses. This glass gives a pleasing cream-colored light.—Horace M. Fulton, Washington, D. C.

Ripsaw Cuts Large Nail without Injury



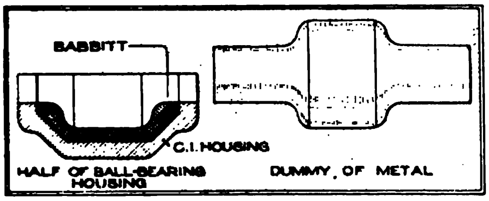
A nail-cutting trick which has many practical uses, and which will interest users of handsaws, is performed as follows: The performer announces that he will cut off a tenpenny nail with a ripsaw without injuring the saw. He then notches the back edge of the saw with a hammer, as shown, and, driving the nail into the bench or into a block, cuts it off squarely with the notched edge. This will not deface the saw if the notches are made small, and even adds to the tool's usefulness.—E. Ward, Detroit, Mich.

Pipe Cutter Marks Round Stock for Sawing

Careful work is necessary to saw off round stock with a square end, and the sharp edge resulting is undesirable in many instances. By marking a V-groove in the round bar at the line where it is to be sawed off, a guide is provided for the sawing, and the edge is neatly beveled off, when the cut is finished. Use a pipe cutter for the groove.

Babbitting Mountings for Ball Bearings

When a ball bearing is used in assembling machines, the housing, or mounting, should be finished to close dimensions. This work is expensive. A quicker and cheaper method is to make a dummy of iron, exactly the same size and shape as the inside of the housing. It should be polished, so that no babbitt can stick to it, as shown. The mountings are made in halves. When ready for pouring the babbitt, the dummy is put in one of the halves of the housing so that the shafts of the dummy are resting on the proper bearings in the housing. In order to prevent the hot babbitt from running out at the ends, fire clay, or whiting mixed with asbestos fiber, is used to seal up the ends. The dummy is removed when the babbitt has cooled, and the other half of the housing is babbitted similarly.—Joseph Limbrunner, Shelton, Conn.



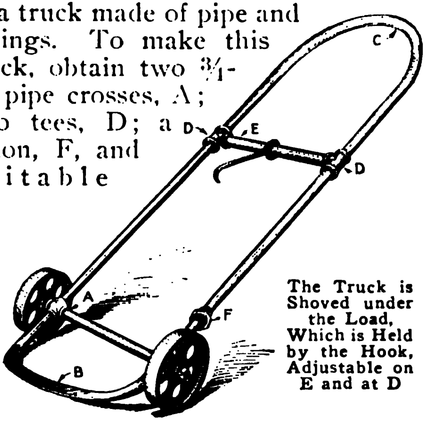
Housings for Ball Bearings can be made Quickly by the Use of a Metal Dummy

Wire Protective Screen Increases Usefulness of Vacuum Cleaner

In the cleaning of trays containing small screws, and similar fittings used in shops, it is inconvenient to remove the articles in order to get at the dirt. Especially when the parts are small, such as metal type, the use of a powerful vacuum cleaner is not practical, and blowing out of the dust is not satisfactory. By covering the trays, or other places to be cleaned, with wire screening, and rattling the contents, the dust may be effectively and quickly removed with a vacuum cleaner.—John Robinson, Hillsdale, Mich.

Barrel Truck Made of Pipe and Fittings

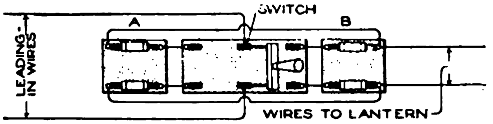
Adjustability to various sizes of loads and great strength are features of a truck made of pipe and fittings. To make this truck, obtain two ¾-in. pipe crosses, A; two tees, D; a union, F, and suitable lengths of ¾-in. pipe for the other parts. Bend a section of pipe, 26 in. long, as shown at B, so that the "U" is 18 in. wide. Thread each of the ends and flatten the central portion at B. Join the crosses on this piece, as shown. Thread and shape the piece C, which is 5½ ft. long, to the same width. Slide the tees D, fixed to the pipe E, on pipe C, setting the hook in place. The latter is made of ⅜-in. round iron, to slide on pipe E. The hook and the bar and tees D may be moved as desired. Fit the union and a suitable nipple at F. Run an axle through the crosses A, and put on the wheels. To use the truck, run end B under the barrel, or crate, and place the hook over the top, holding the load securely.—S. N. Miller, Denver, Colo.



The Truck is Shoved under the Load, Which is Held by the Hook, Adjustable on E and at D

Emergency Fuse Circuit for Motion-Picture Lanterns

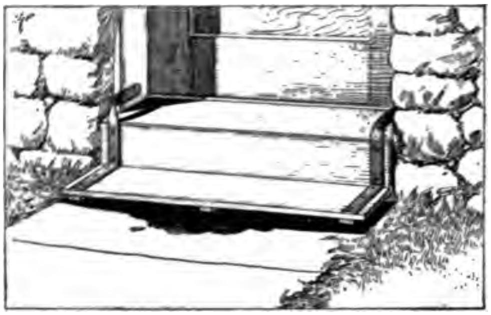
To save time in exchanging fuses in a motion-picture-show lantern room, I devised the plan of wiring shown in



The Operator Simply Throws the Switch into Circuit with the Extra Fuse Block, If the First Set Blows Out the diagram, consisting simply of a double-throw knife switch connected with two fuse blocks, so as to throw either of them into use at will. Thus, if a fuse burns out, it is only necessary to throw the switch over, and go ahead with a new set of fuses, while the burnt-out one may be replaced at leisure.—Fred Kuhlmann, Peru, Neb.

Hinged Tread Covers Puddle at Worn Doorstep

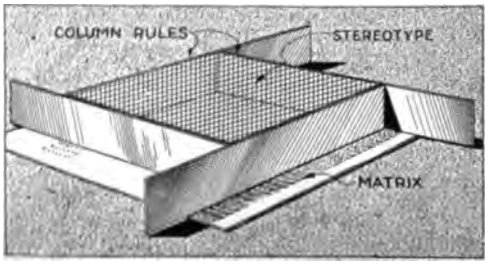
Often it is desirable to lay a board over a spot where water is apt to lodge just outside the doorstep. An improvement on this method is shown in the sketch, being a riser and a tread hinged, by means of two bent iron straps, to the door frame. The hinges hold the step in place and permit its being raised when sweeping.—Albert O'Brien, Buffalo, N. Y.



The Wooden Tread Bridges a Worn Place in the Doorstep, Where Puddles Form

Stereotyping without Special Apparatus

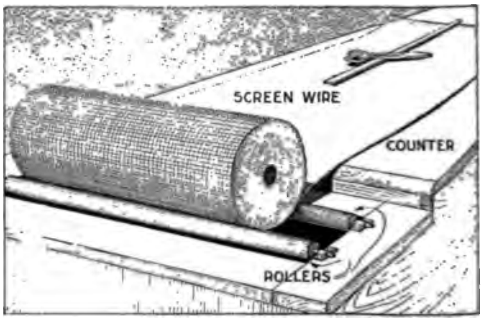
Frequently it happens, in small newspaper or printing offices not provided with stereotyping equipment, that some advertiser wants a cut made from a paper matrix, and it can be done with very little trouble, as follows: The mat is warmed, and laid on a previously warmed stone, or other flat surface. A dam of column rule is built around it, and held in position by weights against the outside. The dam is filled with metal, and, after cooling, the casting is cut down to size, and made type-high by pasting paper or Bristol board to the bottom of the cut. —J. S. Hagans, Toledo, O.



By This Method Small Cuts can be Cast from a Matrix with No Special Apparatus

Device for Unrolling and Measuring Wire Mesh Handily

Screen wire, when being unwound, has a tendency to roll toward the part that is being unwound, and will not remain still. To remedy this, a hardware man made an arrangement as shown. A counter, about 12 ft. long, was used, on which to unwind the wire. On one end of the counter, two rollers, 2 in. in diameter, were placed, about 4 or 5 in. apart. The rollers were set so that the roll of wire can be placed on them, and then be unwound. The weight of the wire holds it on the two rollers. Rolls of screen wire can be kept handily under the counter on special shelves.—Lee M. Delzell, Maroa, Ill.



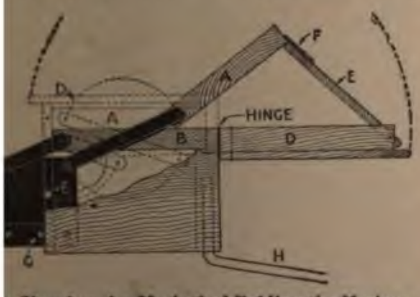
The Awkward Handling of Screen Wire in Rolls is Overcome by This Arrangement

¶By slitting the point of a pen-filling quill on an ink-bottle stopper and bending it into a cuplike form, ink can be transferred to the ruling pen more handily.

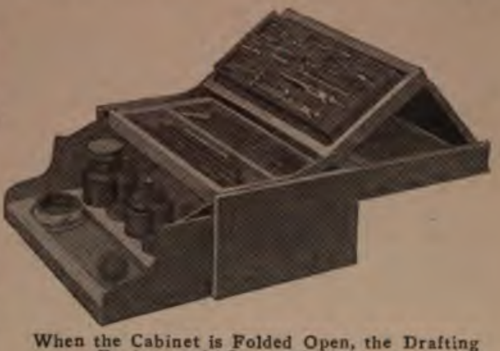
Folding Cabinet for Drafting Equipment

vision is made for the storage of it variety of drawing equipment ruments, pens, brushes, inks, etc. small space, by the cabinet de- d, and the contents are readily ible when needed, or in use. It e placed on a stand or drafting but a better arrangement is to t it on a swinging wall bracket, h radius that the contents can be to the most convenient position. not in use, the materials are d into their places, and the cabi- osed up and swung out of the No dimensions are given, as will be governed by the equip- to be housed, and the space ac- odations.

outfit, as shown, consists of trays and an outer case, the upper wer trays C and A being mov- while the center tray B is sta- y. The various kinds of materials ools suitable for the compart- are suggested in the photograph. onstruction and operation of the are shown in the sectional view. the case is closed the compart- C slides back into its original The compartment A folds down icated by the dotted line, and the D folds forward to its dotted on. The brace E, which is held ce by the clip F when supporting ised tray A, is released and folds the cover section D, when the is closed. The compartment C ked into place by a metal strip ing the round-head screw G, and the arm H is set into a hole bored in a block, glued in one corner of the lower section.—T. T. Sturgeon, Los Angeles, California.

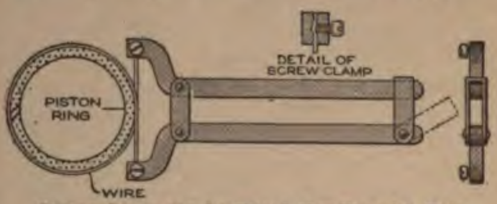


Showing the Method of Folding the Various Sections into the Cabinet


When the Cabinet is Folded Open, the Drafting Equipment is Compactly Arranged, Yet Easily Accessible

Tool for Fitting Piston Rings

When assembling the pistons and cylinders of gasoline motors, trouble is usually experienced in inserting the piston rings. An effective tool for this purpose is shown in the sketch. A piece of music wire, $\frac{1}{16}$ in. in diameter, is given a turn around the piston ring, and the two ends are fastened in the proper ends of the levers, as shown, by means of the clamping screws, with the handles wide apart. When the handles are brought together and clamped in the loop, the wire is tightened up and the piston ring compressed, so that it will readily enter the cylinder. The tool can be made to suit the pistons, and should be made of $\frac{1}{16}$ by $\frac{5}{8}$-in. strap iron, and about 9 in. long over all.—W. B. Burr, Boston, Mass.

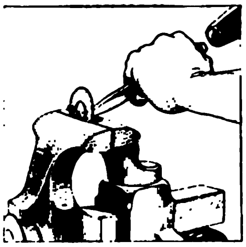


Piston Rings can be Fitted Handily with This Homemade Tool

¶A good working surface is provided on a drafting table by covering it with smooth, heavy paper.

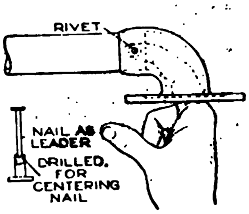
Cutting Thin Metal Washers by Hand

When washers are needed, heavy metal or tools with which to make them are sometimes not at hand. Washers made of thinner metal may be substituted, several being used to build up the proper thickness. An easy method of cutting these is to mark them on the sheet metal, trim them off on the outside, and cut the centers out with a cold chisel. Turn the washer as the cut progresses, guiding the chisel on the vise.—Hugo Kretschmar, West Nyack, N. Y.



Setting a Rivet Handily in an Awkward Place

To get a rivet into an awkward hole so that it can be riveted from the outside, put soft laundry soap on the end of the finger, press the rivet in firmly, and put the finger at the rivet hole. With the other hand, put the nail in as a leader, and work the rivet into the hole. A small countersunk hole in the end of the rivet makes it easy for the nail to engage the rivet.—Arthur F. Stern, Milwaukee, Wis.

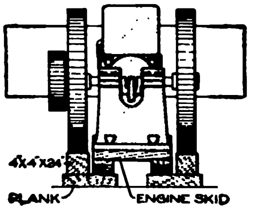


Measuring the Velocity of a Stream

To measure the velocity of a stream, step off or measure 120 ft. along the bank, where a straight course may be found. Throw several floats—tightly corked bottles will do—into midstream, and time them over the 120-ft. course. The average time of all floats divided into 100 is the average rate per min- Water flows faster at the top of the stream than at the bottom and sides; the ratio of 100 to 120 is about the proper one to correct for this fact, giving the average velocity at a given cross section. By using the 120-ft. course, the calculation is simplified.—R. Z. Kirkpatrick, Washington, D. C.

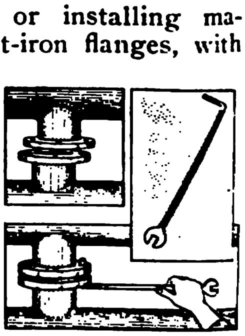
Gas Engine Transported by Rolling It on Flywheels

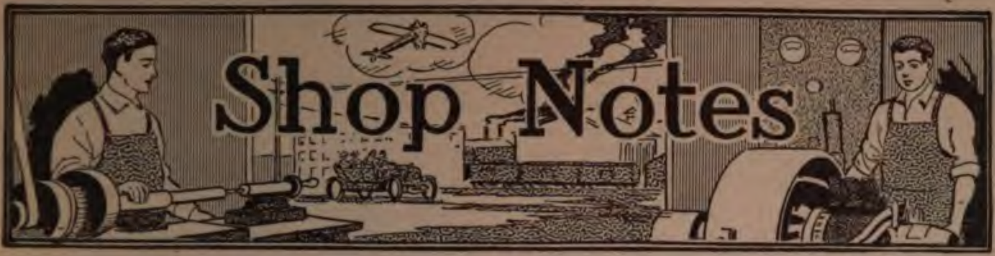
To obtain the maximum hours of daily service from a gas engine, I was obliged to move it from place to place. By using squared pieces of timber under the flywheels on which to roll the engine on the wheels, this work was made easy for one man. By turning the wheels the engine can be moved readily considerable distances, the timber being moved forward as required. The water tank should be empty. Timbers 4 ft. long are handiest, especially in turning corners. Unless in a dusty place, it is well to open the compression-relief cock when moving the engine in this way.—J. E. McCormack, Haliburton, Ont., Can.



Handy Wrench with Drift-Pin Handle

When erecting or installing machinery where cast-iron flanges, with bolts, connect the parts, it is often necessary to draw one of the flanges into place, to get the bolt holes to match. When there is not sufficient clearance to use a mandrel or drift pin, a rod bent to a short right angle is handy. An angle of this kind forged on the handle of a wrench, as shown, combines two useful tools, and has proved quite popular, as indicated by frequent borrowing of it.



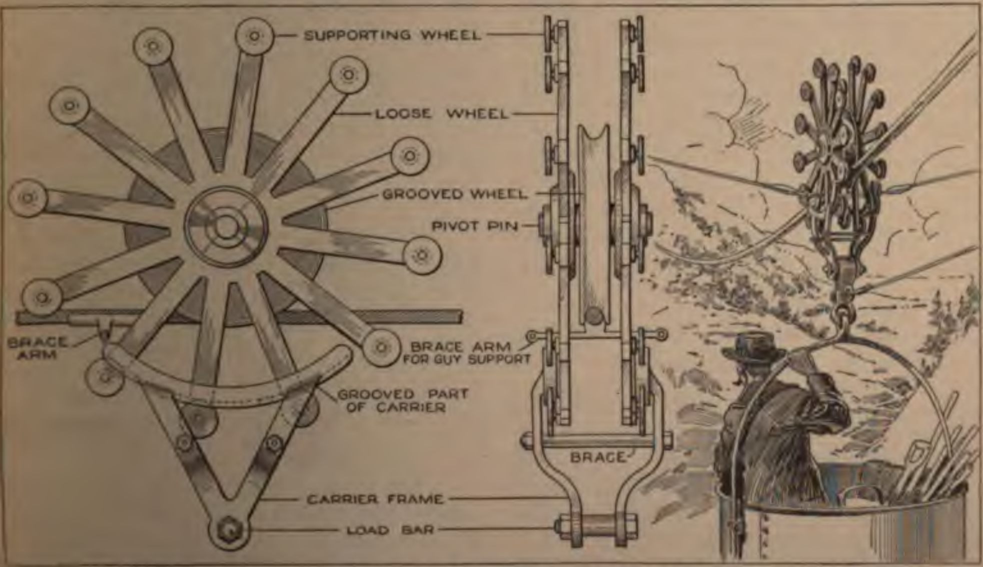


Cable Trolley Rides over Guy Wires in Its Path

By J. S. Zerbe

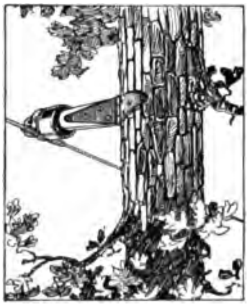
THERE are many places where it is impossible to run cables for the transmission of carriers for ore or other products around mountain sides, or across gorges, without using guy wires laterally from one or both sides of the cable. The suspension of the buckets, below such a winding and stayed cable, is accomplished by a contrivance in which the trolley wheel, which supports the carrier on the cable, is rigged with two spider wheels and a special carrier frame, as detailed. The pivot pin of the trolley wheel extends out, to receive, at each end, a spider, the arms of which project beyond the periphery of the trolley wheel, as shown in the side view. The ends of these arms, or spokes, are each provided, on their outer sides, with an antifriction wheel. The carrier frame is grooved to ride on these wheels. This frame is built up of two sidepieces, generally triangular. The upper rim of these plates is curved and grooved to ride on the antifriction wheels. These pieces are joined together below the spider by bolts, as shown in the end view. The load is carried on the load bar of this frame. The spiders turn independently of the trolley wheel.

When the trolley wheel moves in either direction, the spider wheels do not turn until one of the arms strikes a cross wire. The cross wire then passes up between the arm which strikes it and the next arm ahead. The action is a stepping over the guy, or cross wire. The carrier passes beneath



When a Guy Wire is Encountered, the Trolley Wheel Rides on the Cable, Passing over the Wire, and the Load is Carried under the Wire, by Means of the Spider-Wheel Device, Which Supports the Load Carrier the cross wire, riding along on the antifriction wheels, as the spiders revolve. The spiders again remain stationary until the next cross wire is reached. The propulsive force can be applied to the pivot pin of the trolley wheel, or to the carrier; in either case the spider will ride over, and the carrier beneath, the guy wires. This arrangement can also be used for a large variety of suspension cable lines for amusement devices, as the lines can be run in many directions in a comparatively small area, and can be laterally supported so as to prevent a swinging motion. Two of these wheels can be used to support motive power, the trolleys being connected by a frame. The carriers are thus self-contained, and useful for transporting products by cable where the usual motive cables are not practical, or economical.

Hinged Insulator Brackets Prevent Breakage of Wires by Swaying



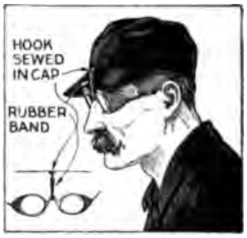
Municipalities with electrolier street lighting often find trouble in keeping the overhead wires from rubbing on trees. The swaying of the trees wears the insulation from the feeder wire, and on wet days produces a partial ground and leakage of current. Steel pins driven into the trees, or wooden brackets spiked on, with the feeder securely tied to the glass, or porcelain, insulator, are unsatisfactory, in many cases causing an almost perfect ground. A simple remedy was devised by attaching a wooden wire bracket to a large hinge, spiked to the tree trunk. The swaying in the direction of the line is provided for in the hinge and the cross swaying in the slack in the feeder wire.—J. F. Bront, Denver, Colo.

Air Pumped through Water Jacket Cools Gasoline Motor

A four-cycle, water-cooled gasoline engine was installed in a small shop and used only intermittently for small jobs. When the weather became cold, the danger from frost and the job of filling and emptying the tank and jacket caused the operator to devise an air-cooling system for it. Into a collar of suitable size he put a projecting pin, in such a manner that when the collar was put on the end of the crank shaft, the pin served as a crank pin. From this improvised crank pin he operated bellows attached to the floor below. By means of hose, he connected the nozzle of the bellows with the lower water connection of the water jacket. This caused air to circulate through the jacket while the engine was in motion. Frost did not injure it, and it required practically no attention. The method is, of course, hardly feasible on an engine running for long periods.—J. E. McCormack, Haliburton, Ont., Canada.

Weight of Goggles Relieved by Rubber Band

In steel foundries, or shops, where the eyes of the workmen are endangered by flying particles of steel or sand, many of the men do not keep their goggles on as much as they should, because the goggles are heavy, and unless a man is used to wearing glasses continually, the weight on the bridge of the nose is annoying. A light rubber band looped over the bridge of the goggles and slipped into a small hook of a hook and eye, sewed on the edge of the cap or hat band, as shown, relieves the pressure. The adjustment desired can be obtained by moving the cap.—J. A. Fitzpatrick, Altoona, Pa.



ughening Slippery Iron-Floor Plates

en iron-floor plates become worn th, they are dangerous under foot, ially when wet. A method of ening them slightly is as follows: a small quantity of powdered sal niac thoroughly with fine sand. kle the mixture over the iron covering it with a thin layer. en the surface with a sprinkling nd permit the material to remain night, or preferably over a holi- Sweep up the sand, and it will und that a rough coating has been d, which will last several weeks. rocess may be repeated until the d roughness is obtained.

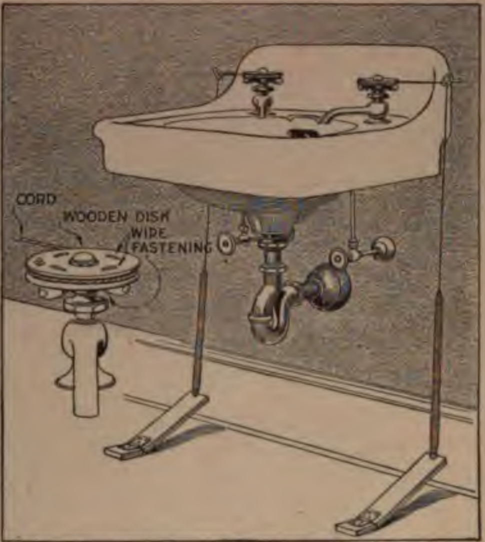
Raised Letters and Designs Painted with Roller

quick and effective way of painting aised letters, with flat faces like or other designs, is to roll over with a small roller such as print- se in inking type when they pull of. The paint is carried on a , and the roller is covered with by running it across the board. me cities the names of streets, on posts at the corners, are written t-faced white letters, raised, on a round of green, and this method used with success to paint the s after the post had been painted —Alfred J. Miller, Albuquerque, Mexico.

Time was Saved in Painting Street Signs by This Method

Pedal Controls for Washbasin Faucets

A physician has an ingenious device in his operating room by which he can turn on the water in the lavatory with-



With This Arrangement the Faucets can be Turned On with the Foot, the Hands Not Soiling the Handles

out gripping the handles of the faucets at the washbowl. This is a sanitary feature of importance in his surgical work. The arrangement consists of two pedals fastened to the floor beneath the washstand, and rigged as shown. They are hinged to the floor, and the free ends are held slightly elevated by cords. These cords run through screw eyes in the wall, and are connected to pulleys set on the faucets, as detailed. By treading on either pedal, the corresponding faucet is turned on; when the pressure is released, the spring in the faucets shuts off the water.—John D. Gilbert, Eugene, Ore.

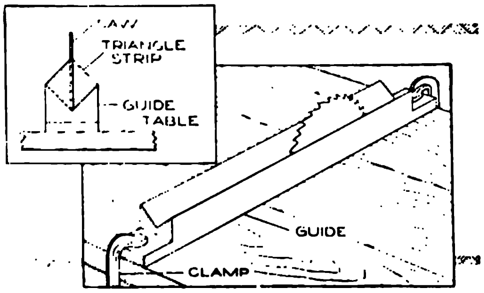
Gate Adjustable to Heavy Snowfall

In regions where the snowfall is heavy, especially on the farm or in suburban places, considerable labor is involved in shoveling away the snow so that gates can be opened at their usual level. By arranging the gates so that they can be raised above the level of the snow as it accumulates, much of this labor becomes unnecessary. In the arrangement shown, a heavy iron pipe, 3 ft. higher than the usual height of the gate, was set in a concrete base and supported by bolts through the fence posts, at the hinged end of the gate. The gate was arranged to slide vertically on this pipe, which supported it from large eyes, or loops around the pipe. Holes bored through the pipe at intervals were fitted with adjusting pins, one for each hinge support of the gate. The gate was quickly raised to the proper level, and the pins set into place.—Ethel S. Platt, Traverse City, Michigan.

Instead of Shoveling a Path for the Gate at Its Usual Level, It is Raised and Supported on Pins Set in the Long Pipe

Guide for Cutting Triangular Strips on Circular Saw

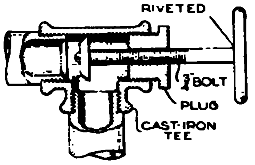
In reinforced-concrete construction the inner corners of the beam and column forms are filled with triangular wood strips, known as fillets. The contractor's circular saw usually is not equipped with a tilting table, and some sort of a jig is required for ripping the fillet strips from the square stock. The sketch shows such an arrangement. A trough-shaped guide, with a slot to accommodate the saw, is clamped to the saw table, and the square stick is pushed along this guide.—J. J. O'Brien, Buffalo, N. Y.



The Guide is Clamped on the Saw Table and the Squared Stock Ripped Diagonally

A Homemade Low-Pressure Angle Valve

A low and medium-pressure valve, that is valuable as an emergency device, and which also gives good service as a fitting for the home workshop, was made of materials easily obtained. This valve possesses points of superiority over some commercial valves for when the valve is open, the water, etc., passing through the pipes, has an unobstructed flow, and because of its simple construction will appeal to the home mechanic. It is made of a tee in which is fitted at one end a pipe, beveled to form a seat for the valve. In the other end of the tee is a common plug, drilled and tapped centrally for a ¾-in. bolt used as a valve stem. The handwheel is a makeshift, and a plain metal or fiber disk, beveled to fit the valve seat, is fastened to it with a screw. The valve was designed especially for a low-priced tree-spraying and painting machine.—J. B. Murphy, Plainfield, N. J.



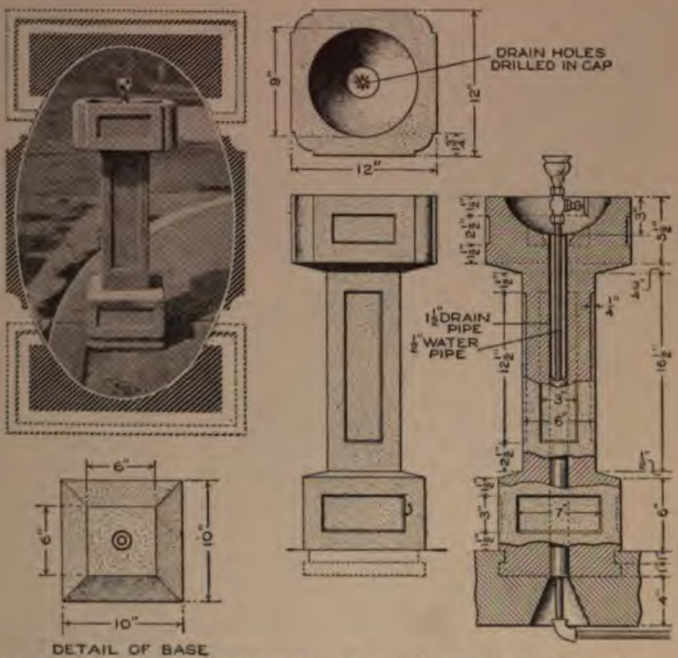
Scraping Dirt from Piston-Ring Grooves

I put in many piston rings in automobile-repair work, and as it is quite a job to scrape carbon from ring grooves, I use a section of a broken piston ring as a scraper. It is fitted in a file handle, and scrapes both the sides and bottoms of the grooves.—Irl R. Hicks, Centralia, Mo.

A Sanitary Drinking Fountain of Concrete

By GEORGE E. TONNEY

BUBBLING drinking fountains are being installed on the sidewalks by many cities throughout the country, but because of the expense fewer than needed are often provided. By making forms for a substantial, artistic fountain of standard design in concrete, like that shown in the illustration, these public conveniences can be built at small cost. The mold, as detailed, is adaptable to a large variety of designs. It is built up of wood, joined together at the four corners in a miter joint, and the sections are held together, while the form is in use, by a top and a bottom plate, and wires twisted around the shaft portion of the mold. The concrete is poured in through an opening in the upper frame, or plate. For quantity production, several duplicate forms may be made. The water-feed pipe is incased in a 1½-in. drain pipe, cast into the mold when the concrete is poured in.

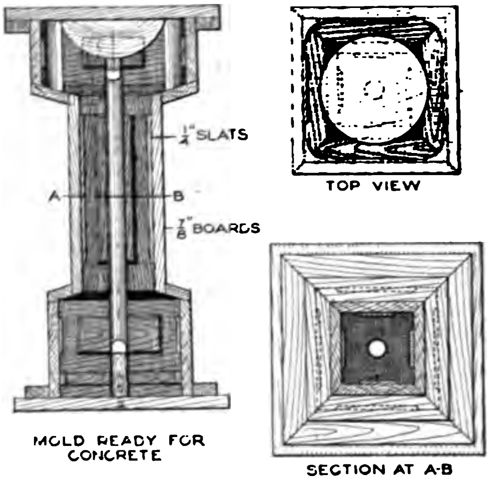


This Substantial and Artistic Sidewalk Bubbling Drinking Fountain was Made in a Simple Wooden Form, Which can be Adapted to a Large Variety of Designs

The construction of the fountain, detailed briefly, is as follows: Lay out a full-size sketch of the fountain, as shown in the sectional view of the working drawings. This can be done handily on a wide board, or on a long strip of wrapping paper. Indicate both the front and top views, and then lay out the parts of the wooden form, as detailed in the top view and the vertical section of the mold ready for the concrete. The wood used is ⅞ in. thick. Care must be taken in laying out this drawing carefully, especially as to the joining of the pieces, which are arranged to be nailed handily. In shaping the pieces make all the light strips at the same time, cutting a board long enough for all the shorter sections of each variety. Fit the pieces to the full-size drawing, and cut them, for the corner joints, in a miter box. Smooth the inner surfaces of the pieces carefully before nailing them together.

When the outer ⅞-in. boards are shaped and fitted for the four sides, nail them together, driving the nails part way in, and fit the sides together. Then make the top and bottom frames to hold the sides in place. If the joints fit snugly, drive the nails in and set their heads slightly below the surface.

Before putting the panel blocks into place, smooth off the inner surface of the mold and sandpaper away all the sharp corners. Then make the panels, which are ¼ in. thick. Nail them into place, centering them carefully on the sides of the sections. The panels should be beveled slightly, so as to withdraw readily from the concrete. Fill all of the nail holes smoothly with plaster of Paris. Make a wooden block for the basin at the top of the fountain, and arrange it to be set on top of the pipe, which is adjusted carefully in the center of the mold and held in place by nails driven into blocks set in the ends. A tin pan may also be used to form the basin. Apply two coats of shellac, sanding them lightly when dry, on all surfaces of the mold which come into contact with the concrete. If the mold is to be used repeatedly, it will pay to use extra-good wood, preferably pine, and to soak the wood in oil.



MOLD READY FOR CONCRETE

TOP VIEW

SECTION AT A-B

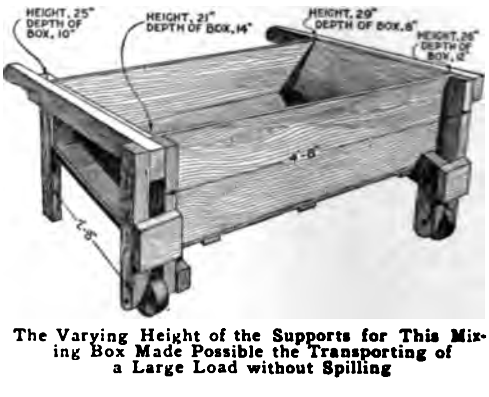
In Making the Forms, a Full-Sized Diagram is Laid Out and the Pieces of Wood Fitted Accurately to the Drawing

If the form is properly made, little difficulty should be experienced in setting it up and pouring the concrete. Apply a uniform coat of linseed oil to the inside of the form. Bind the center portion of the form tightly with heavy wire, and set the top and bottom frames securely into place, tacking them with light wire nails. Mix a 1:3 mixture—one part Portland cement to three parts coarse clean sand—making it quite wet. Pour in the mixture, and jar the mold slightly to insure that the concrete runs into all the corners. Permit the fountain to dry at least 18 hours, in a cool, dry place. Remove the form carefully, tapping it slightly to prevent any of the corners from breaking. Repair any breakage or holes by filling the spots with the mixture. Wet the fountain for several days, while it is permitted to dry thoroughly. If desired, the surfaces may be tooled smooth by applying a paste of cement.

Provision is made in the mold for locking the fountain securely into the concrete sidewalk, as shown in the sectional view. The fountain is set in a recess in the sidewalk, 2 in. deep, and concrete surfaced around it to the lower edge of the paneled base.

An Improved Mixing Box for Mortar or Grouting

In repairing a roadway, the varying levels and the crown from the curb to the center made it awkward to use a box of the ordinary construction, mounted on wheels, for mixing the grouting and moving it from place to place. When the box was nearly full, the varying level of the material caused splashing and spilling. A special mixing box was therefore constructed, the principle of which can be adapted to mixing boxes for various uses. The mixing trough was constructed so that the mixture flowed to one corner, which was the deepest. The top of the box was so arranged, by varying the height at the four corners, that it was level in spite of the curve of the roadway when the box was transported, the back end being raised.—J. E. Cahill, Jr., New York, N. Y.

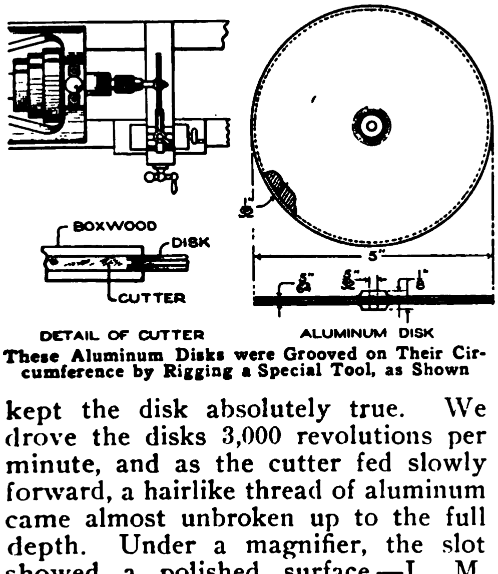

HEIGHT, 25" DEPTH OF BOX, 10"
HEIGHT, 21" DEPTH OF BOX, 14"
HEIGHT, 29" DEPTH OF BOX, 6"
HEIGHT, 26" DEPTH OF BOX, 12"
4'-8"
2'-8"

The Varying Height of the Supports for This Mixing Box Made Possible the Transporting of a Large Load without Spilling

¶ Do not force a tap that binds, but remove it and determine what is the cause, or a broken tap may result.

Cutting Grooves in the Edges of Thin Disks

Having to make slots, 1/32 in. wide by 1/32 in. deep, in the edges of a number of 5-in. disks of aluminum, 5/64 in. thick, to carry fine steel wire, we used the following method: First, in the tool post was fitted a piece of boxwood with a slot, 5/64 in. wide and 1/4 in. long. Over this was placed the special cutter which had a point, 1/32 in. wide and 1/32 in. long, projecting beyond a shoulder, which acted as a gauge for depth. The slot in the boxwood guide was just a snug fit for the thickness of the disks. As the holes in the disks and their hubs were but 5/32 in., and there must be no vibration, such a method became necessary. When all was ready, a very slight turn of the end screw on the lathe moved the carriage slightly toward the chuck. This kept the disk absolutely true. We drove the disks 3,000 revolutions per minute, and as the cutter fed slowly forward, a hairlike thread of aluminum came almost unbroken up to the full depth. Under a magnifier, the slot showed a polished surface.—L. M. Drake, Daytona, Fla.

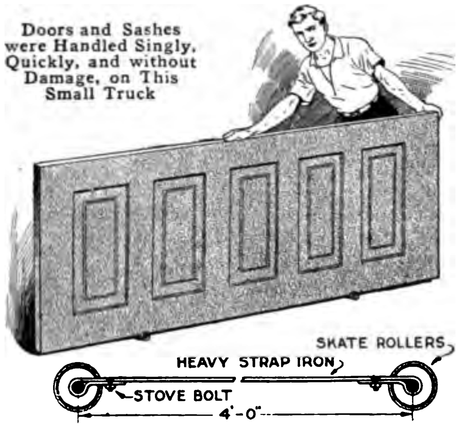


DETAIL OF CUTTER ALUMINUM DISK

These Aluminum Disks were Grooved on Their Circumference by Rigging a Special Tool, as Shown

Roller-Skate Truck Saves Carrying Doors and Sash

In a sash-and-door factory, much time and labor was saved in moving doors, and similar products, by the use of a small truck made of a roller skate. The four wheels, with the two axles, from an old roller skate were removed, and the distance between them lengthened by a strip of strap steel, about 4 ft. long. This was bolted to the center of the two axles, as shown. The doors were quickly shifted singly, in spaces where a large truck could not be used. —Dale R. Van Horn, Milton, Wis.

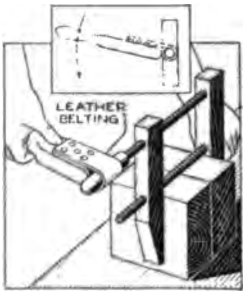

Doors and Sashes were Handled Singly, Quickly, and without Damage, on This Small Truck

Stock Racks for Rods and Pipes Quickly Devised

On a large machine job, where a great quantity of steel rods had to be handled quickly, it was found that the necessary racks were not available in the shop. As the work was only temporary, it was not desirable to make additional racks, and a makeshift was devised. Steel kegs, or drums, used in the shop were set up in pairs, and lengths of iron pipe, or rod, set in them to form a rack, as shown in the sketch. The arrangement proved very efficient, it being easy to transport the pipes and kegs from place to place, as needed. —Charles Doescher, Waterbury, Conn.

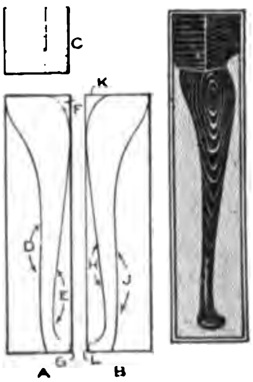
This Method of Storing Pipes or Rods Temporarily can be Adapted Widely, Using Wooden Kegs or Boxes if Necessary

Leather Wrench for Tightening Screw Clamps



Many workmen, especially those who make use of the common wood clamps only occasionally, blister their hands in attempting to tighten up the screws on hand clamps of the cabinetmaker's type. In order to avoid this, a handy tool can be used, that is made of a strip of leather belting fastened to a handle with screws, as shown. The leather loop acts as a wrench, and the clamp screws can be tightened as securely as desired by the use of this tool.—Henry Wedde, Chicago, Ill.

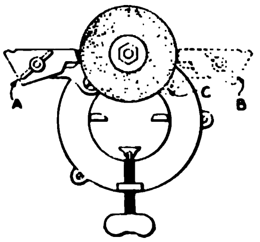
Band-Sawing Cabriole or Curved Furniture Legs



Among the many pieces of work brought into a job shop, or undertaken by the ambitious home cabinetmaker, one which is perplexing to the workman who undertakes it for the first time, is the band-sawing of a Dutch or cabriole leg. A pattern for the work is desirable. The outline is marked upon two adjoining sides of the stick from which the leg is to be sawed, as indicated at A and B, C being a top view. The cuts D, E, F, G, should be sawed first. Cut each piece whole, and lay it back in the place from which it came, to provide a true surface upon which the stick may rest while the other sides are being sawed. Each piece may be held in place by by fastening with small brads so the saw will clear them, or by gluing them lightly. The latter is the best method if time permits. Next saw through H, J, K, and L.

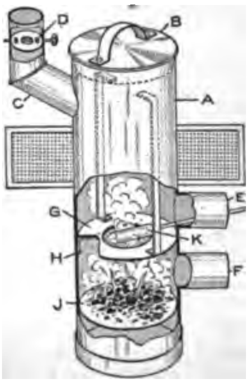
After band-sawing the leg, it will be square in section, and often a leg of this sort is finished this way. If finished round, as in the sketch, careful work is necessary to make the sweeping curves without destroying the proportions and outlines of the leg.—Charles A. King, East Kingston, N. H.

Changing Grinder to Left-Hand Drive



A hand grinder which I used in my home shop was arranged so that the grinding was done with the left hand, while turning a crank with the right hand, in using the tool rest. I drilled a hole and tapped it, as indicated at C, so that the tool rest may be used either at A or at B. The grinding may thus be done with either hand, as is convenient.—Hugo Kretschmar, West Nyack, N. Y.

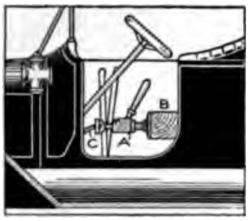
An Improved Charcoal Soldering Furnace



This soldering furnace, which I made and have used for some time, is quite an improvement over the old kind. To make it, obtain a can, A, 6 or 8 in. in diameter and 18 in. tall, with a lid, B. Rivet on a piece of 2-in. sheet-iron pipe, C, having a damper, D, as shown. Next rivet on two pieces of pipe, 2 in. in diameter and 3 in. long, E and F. Fit a piece of sheet iron, G, inside of the pot, providing lugs, H, for riveting it to the can at three places. Cut a 4-in. opening in this, and rivet it just below pipe E. Put a charcoal fire in the bottom J, and it is ready for use. The soldering iron K is inserted through the pipe E. As considerable air goes in at E, the handle of the iron will not heat easily or burn. The draft for the fire goes in at pipe F. The copper itself will heat more quickly, owing to the intensity of the heat through the hole H.—R. S. Matzen, Fort Collins, Colo.

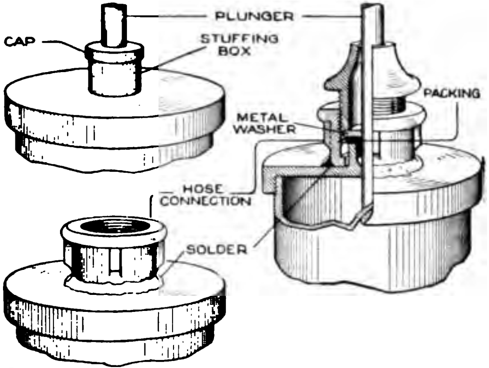
One-Man Method of Adjusting Auto Foot Brakes

Many automobile owners neglect the close adjustment of foot brakes, causing needless expense and possible danger. The principal reason for such neglect is that it usually takes two men to adjust the brakes successfully. One presses the pedal, while the other tests the wheels to insure even breaking power. One man may easily and successfully adjust the brakes with the use of a jack, as shown in the illustration. The jack A, with a block, B, to protect the seat, is placed between the seat and the brake pedal C. The jack is applied to the desired pressure on the brake pedal, and the proper adjustments made.—Koerner Rombauer, Prescott, Ariz.



Repair for Air-Pump Stuffing Box

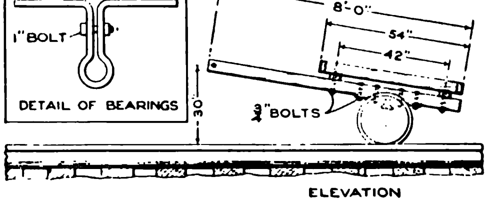
When the fine threads of the brass stuffing box on an air pump became so worn that they no longer held, the following method of repairing it was used: The stuffing-box cap was removed and its threads filed down until they cleared the inner threads. Two hose connections were procured, and one soldered into place, as shown in the sketch. The other was screwed into place with a metal washer between it and the stuffing-box cap, so as to distribute the pressure evenly on the cap head. The repair proved even stronger than the original arrangement.—James M. Kane, Doylestown, Pa.



Hose Connections were Used to Repair the Stuffing Box, Making It Quite Serviceable

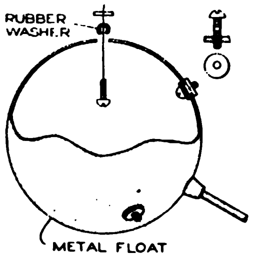
Handcart for Railway Tracks

For use in repair work on tracks and other railway equipment the handcart shown in the illustration was found convenient. It is strongly built of oak and mounted on an axle fitted to a set of flange wheels. The frame is supported on the axle by means of two bearings of strap iron, formed as shown in the detail, and bolted to the frame.—Roy H. Poston, Flat River, Missouri.



Heavy Loads are Carried on This Cart for Railway Repair Work

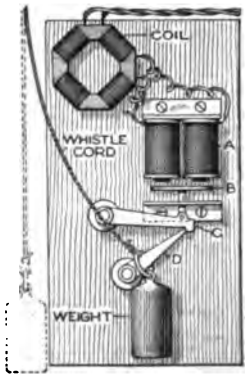
Stopping a Hole in a Hollow-Metal Float



A simple and effective method of repairing a leak in a float is as follows: Ream out the hole in the float to the size of the head of the $\frac{3}{16}$ by ½-in. stove bolt used. Tie a piece of string to the bolt, as shown; push the bolt into the ball, and place the washer over the string. Double the washer and force it through the hole in the float. Pull up the bolt through the hole in the washer, and screw on the nut. The bolt will not turn, and considerable pressure can be put on the nut without pulling the washer through the hole.—James E. Noble, Portsmouth, Ont., Can.

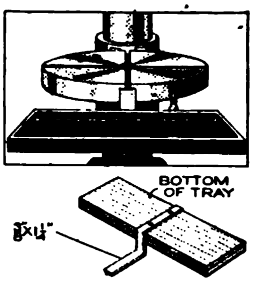
Fire or Warning Whistle Operated by Electric Release Weight

A reliable electric trip for a fire whistle, suitable for small towns or villages, was constructed as shown in the diagram. The weight fastened to the whistle cord is hung on a lever, D. This lever is held in place by a hook, C. Both the lever and the hook pivot on bolts. A magnet coil, A, is placed directly above the hook, and its armature, B, is attached to it by a short connecting rod. When the current is turned on, the magnetic action in the coil lifts the hook, allowing the lower lever to drop. The whistle weight then slides off the lever, opening the steam valve, and blowing the whistle. The controlling switch may be located at the local telephone exchange or city hall. When an alarm of fire is telephoned in, the telephone operator turns on the switch and immediately the whistle sounds the alarm. When the weight is replaced, the device is in readiness for the next alarm. The device may be arranged on the ordinary 110-volt circuit with suitable fixtures. Various kinds of warning whistles may be similarly controlled.—P. E. Bertram, Crystal Lake, Illinois.



Drill-Press Table Supports Tool Tray

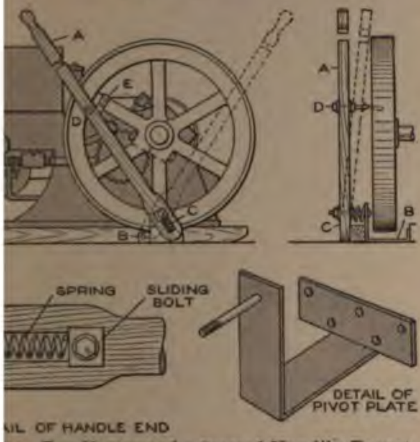
Many times when using a drill press, the job takes nearly all of the table, and there is no room for calipers, gauges, etc., without danger of losing them. I have found a little table, made as shown in the sketch, very useful. A bar of iron or steel, to fit the slot, is bent with an offset so that the top of the tray set on it will be below the top of the drill-press table. A wood tray is fastened to it by two round-head bolts. The tray can be used on the table where most convenient, and laid aside quickly when not needed.—Alfred E. Carter, Providence, R. I.



A Starting Handle for Small Gas Engine.

A neighbor who had a 4-hp. pumping engine, was often away when water was needed, and, as his wife could not turn the flywheel over to start the engine, he rigged up a device for starting the engine and the pump without any undue effort. A hardwood lever, A, of a length twice the diameter of the flywheel, was fitted as shown. The lever is wider at the bottom, and through the center is sawed a slot as detailed. The pivot plate B was made by a blacksmith. It just clears the f the flywheel. A coil spring is between the pivot bolt and the m of the slot, at C.

install the device, turn the engine the compression point is reached, ne spoke of the wheel is slightly above the horizontal. Then fas- pin, E, to the spoke, about 2 in. m the rim, and a bolt, D, to the to engage the pin at this point. operation is simple. Turn the to compression, engage the bolt er E, on the under side of the , and pull sharply forward by ndle. As the rim rises in its rev- n, the bolt follows it by means of lot and spring regulation in the end of the lever. The bolt D is out from its place at the pin E action of a second coil spring at ttom of the lever, eliminating any r if the grip on the lever is re- too soon. When not in use the is laid on the floor beside the —L. B. Robbins, Harwich, chusetts.



ne, Too Heavy to be Started Handily Except Strong Person, was Rigged with a Starting Lever That a Woman can Use

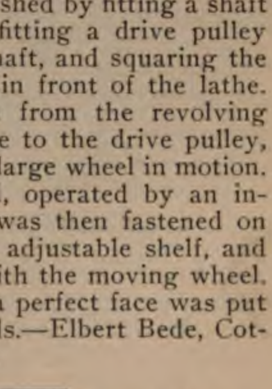
rge Wheel Refaced on Lathe Rigged as Grinder

chinists in small communities, there is not sufficient work to machinery for many kinds of often have their ingenuity tested. photograph shows how a job, many machinists, without special equipment, would have given up as impossible, was done. The wheel on the framework is one of two used for a band saw to run on. The machine had been left out in the weather until the surface was rough and uneven. It was necessary to dress the face, and the shop had no equipment for handling work of that size. The job was accomplished by fitting a shaft into the wheel, fitting a drive pulley onto the same shaft, and squaring the arrangement up in front of the lathe. A belt was run from the revolving shaft of the lathe to the drive pulley, thus putting the large wheel in motion. An emery wheel, operated by an individual motor, was then fastened on the lathe, on an adjustable shelf, and put in contact with the moving wheel. By this method a perfect face was put on the two wheels.—Elbert Bede, Cottage Grove, Ore.

By This Simple Yet Ingenious Arrangement a Special Machine Job was Accomplished in Spite of Very Limited Equipment

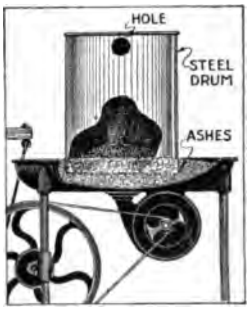
Safety Gas Cock with Ball Valve

A simple appliance can be made from any ordinary gas cock insuring a more nearly safe connection with a rubber hose, when the latter is accidentally pulled from a gas heater, or stove, unnoticed. A coil spring and a small rubber ball, with retaining collar, are fitted, as shown. When the hose is removed from this gas cock



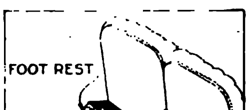
the rubber ball springs in place, stopping the flow of gas. The wire set in the end of the hose pushes the ball from the opening when the hose is attached. —A. H. Hale, Brooklyn, N. Y.

Hood Confines Forge Fire for Intermittent Use



Having trouble with the fire going out in a portable forge, as soon as I left the blower, I overcame the trouble by fitting a 100-lb. sheet-steel, white-lead drum over the fire. A 2-in. hole was cut in one side close to the bottom. To hold the fire for some time, I heap the coals in the middle of the forge, place the drum over it, and press the rim firmly into the ashes around the fire. The fire inside is protected from drafts, and will keep for a long time.—Dennis L. Wilson, Orr's Island, Me.

Foot-Rest Locker Built into Auto Tonneau



A locker set crosswise in the tonneau floor of an automobile, just behind the front seats, and fitted with hinged covers, inclined at the correct angle to make them serve as comfortable foot rests, is a practical feature that the autoist, himself, may install. The covers and the top of the locker are bound in brass and carpeted with the same material used on the floor of the tonneau. Each lid is fitted with a lock, and the compartment is subdivided as desired. It extends to a depth of 3 or 4 in. below the floor level. Robes can be locked up to prevent theft when the car is left unguarded, and one of the chambers can be used for carrying the pump, jack, and other frequently used tools, which, if stored under the back seat, cause considerable inconvenience to the passengers. Where the drive shaft interferes, a space can be left for it.—Winsor R. Davis, New York, N. Y.

Attaching a Hose Coupling with a Vulcanized Joint

A good method of fastening a metal splicer in rubber hose is one by which the coupling is, in effect, vulcanized into the end of the hose. Support the end of the hose securely, as shown, clamping a block of wood over it with nails. The hose can also be held in a vise. Hold the coupling with a pair of pliers, and heat it in a flame to a dull red. Then the hot coupling is thrust into the end of the hose, where it will stick, and immediately the hose end, with the coupling, is soused in cold water. The rubber has, after a fashion, been vulcanized to the metal. Then, after the usual wire, or spring, clamps have been applied, on the outside of the hose around the coupling, the metal will, under ordinary conditions, give no further trouble from coming out.—R. A. Talbot, Omaha, Neb.

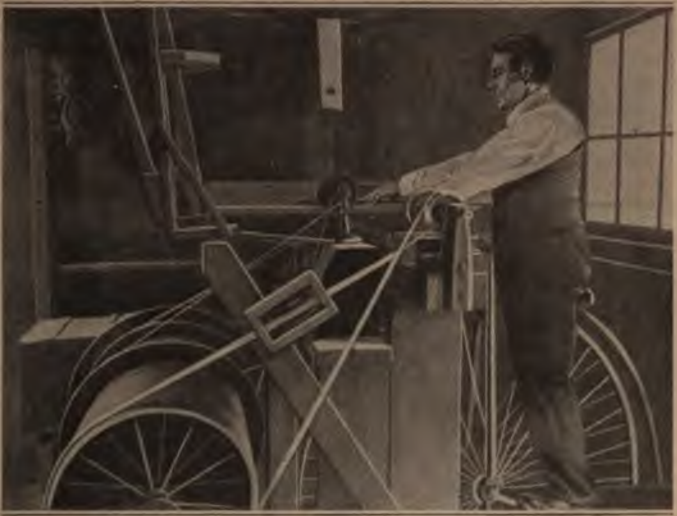
Refacing Jaws of Wooden Clamps

When the jaws of wooden clamps become "chewed up" from heavy use, new life can be given to the clamp by cutting away the inner faces of the jaws along the whole length, deep enough to remove the marred parts. Another way is to cut out about ¼ in. in the front end of each jaw, and fasten in pieces of fiber, or wood.

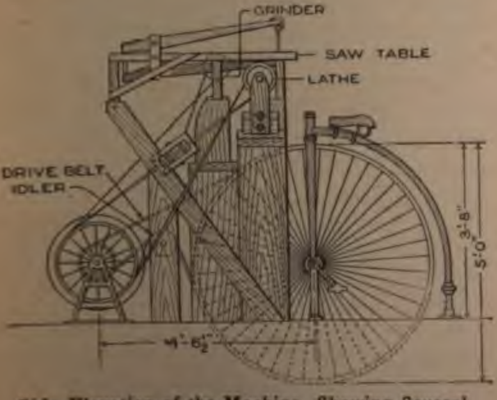
Combination Turning, Sawing, and Grinding Machine

By HENRY L. COOLIDGE

SIX different kinds of machine work can be done on a combination job-shop machine, which I rigged up from an old high-wheeler bicycle: a circular-saw table rips lumber up to 1¼ in. thick and crosscuts stock nearly as thick; a molding-cutting attachment on the saw spindle cuts various kinds of wood moldings; the emery wheel does general grinding, and the lathe, and scroll saw perform the usual work done on these machines, within the range of these features. The photograph shows the machine in operation, and the sketch shows the arrangement of several of the working parts. While the machine cannot readily be duplicated, it offers suggestions for the building of other novel combination machines of pick-up materials. The lathe and emery wheel are shown in the foreground of the photograph; the scroll-saw table is tilted upward, back of the emery wheel, and the circular-saw table is shown in the background. The large wheel of the bicycle was mounted in the frame, and supported on the floor by hangers at the pedal shaft and pipe connections at the rear brace, as shown in the sketch. The lower part of the wheel runs in a pit in the floor. The power is transmitted from the pedal shaft to a countershaft, by means of a round rope belt, running in the tire groove of the large wheel, over an idler, and engaging a 9-in. grooved pulley, set on the middle of the countershaft. Two of the small rear wheels used on this type of bicycle are mounted on the ends of the countershaft, and drums built over them, to carry the necessary belts for the lathe, emery wheel, and other tools.



An Old-Fashioned High-Wheeler Bicycle was Rigged Up to Provide the Driving Gear for This Combination Machine; the Operator is Ripping Stock on the Circular-Saw Attachment



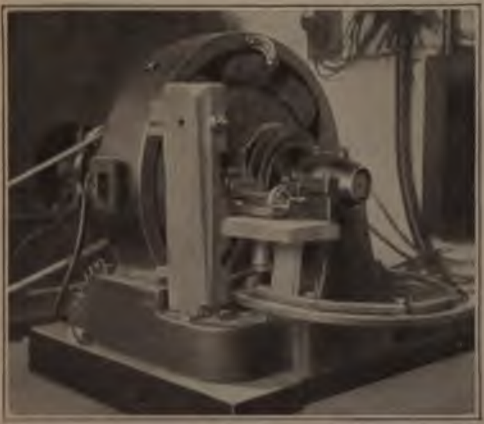
Side Elevation of the Machine, Showing Several of the Working Features, and the Driving Mechanism

The lathe bed is mounted on a wooden platform, and carries the wooden headstock, in which the bearings and spindle are mounted, as indicated. These were made from the bearings and shaft of the bicycle. The tailstock of the lathe is not shown, as it is moved back on the bed, behind the circular-saw table, when the latter is in use. The emery wheel is mounted on an iron stand, which is hinged to fold back toward the countershaft, when the scroll saw is in use.

The scroll saw is mounted in the usual type of wooden arms, and the saw table for it, together with these arms, folds upward, as shown in the photograph. When in use, the front end rests on the lathe bed, and power is transmitted to the arms from the lathe spindle, a lever giving a stroke of 2 in. The circular-saw table is shown at the farther end of the lathe bed, and is folded upward, similar to the scroll-saw table, when not in use. The free end of the table rests on the lathe bed, and is supported firmly. The rip and crosscut saws, and the molding cutters, are mounted on the circular-saw spindle, which is driven directly from the farther end of the countershaft by a pulley and belt.

Motor Commutator Turned Up True in Position

The commutator of a motor became badly worn, requiring truing up. In making the repair, the brush yoke was removed, slipped over the bearing, and laid down, as shown. A piece of timber, fitted with another piece which acted as a knee, on which was fastened a tool rest, was bolted to the motor. The tool rest and slide fixture used were taken from a small speed lathe. This provided a movement for the feed of the tool and the depth of cut. The rigging was fastened firmly, to prevent vibration and consequent roughening of the surface cut. The armature was driven by another motor connected to it by a belt. One side of the commutator may be harder than the other, and so care must be taken when moving the tool across the soft parts to prevent it from digging in.—Harvey Mead, Scranton, Pa.


The Commutator was Turned True Quickly with This Arrangement, and the Motor was Out of Commission Only a Short Time, Because It Was Not Necessary to Take Down the Machine

Rubber Goods Kept Pliable by Oil

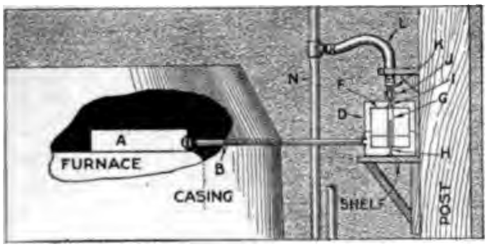
Soft-rubber apparatus deteriorates comparatively rapidly, and a method of preserving it sometimes used by surgeons is to inclose the rubber articles in a tight receptacle, in the bottom of which a small quantity of kerosene oil is permitted to evaporate. A large tin box, or can, with a close-fitting lid makes a good container. Perforated trays are fitted into it to hold the rubber goods. The bottom tray should be several inches above the oil, about two teaspoonfuls of oil being required. The oil must not come in contact with the rubber, which must, of course, be given a thorough washing before use, if sanitation is a requirement.

Automatic Feed-Water Pan for Furnaces

Most hot-air furnaces are equipped with a water pan placed usually at the front, or side, in the narrow space between the outside casing and the fire chamber. Such a pan is commonly filled only when the overbaked smell from the dry pan gives tardy notice of the need of attention. The following description of a thoroughly satisfactory, automatically filled pan devised for a hot-air furnace is suggestive as to further means of accomplishing the same purpose.

The pan A, which need not be large, was placed where a sufficient volume of water could be evaporated, on top of the fire box. The heat might melt soldered joints, so a seamless drum, a container of white lead, was used. A hole was punched through the side, near the bottom and fitted with a horizontal length of ½-in. pipe, B, long enough to extend through the sheet-iron casing of the furnace, a distance of about 2 ft., to a wooden post, as shown. On this post, a shelf was placed to hold a paint can, D, to which the other end of the 1-in. pipe was attached, also near the bottom. Within this can, a float, F, was devised, in the form of an inverted cup, open at the bottom, and guided by a central tube, G, fitted over a vertical wire, H, soldered to the bottom of the can. To the top of the float was attached a needle stem, I, about 2 in. long, serving as a valve stem for the control of the water supply.

A water connection was made by a short length of garden hose, L, as shown. The valve J consisted of a thin sheet of copper soldered over the end of a hose coupling, connected to a nipple, K. A small hole was made in the copper disk, and the needle point entering this hole made a self-guiding valve. The evaporation of the water in the hot-air chamber of the furnace lowers the water level, causing the float to descend and let in water from the hose until the float is raised again, and the water shut off. The regulation of the water supply thus becomes automatic.—B. H. G., Chicago, Ill.



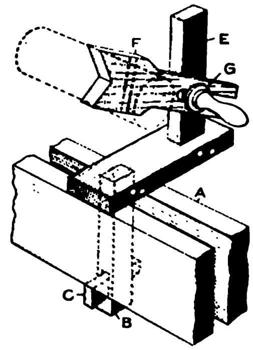
This Arrangement Automatically Keeps the Humidifying Water Tank of the Furnace Filled to the Proper Level, and Insures Healthful Moisture in the Rooms Heated

---

¶A careful operator will not carry developer over to the fixing bath on his hands, or bring them into contact with the developer, until after washing them thoroughly, if any of the fixing bath has come into contact with them.

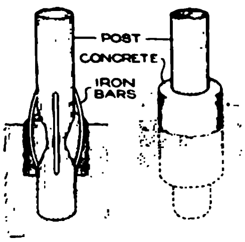
Back Rest for Supporting Wood in Lathe

In turning a long piece upon an ordinary wood-turning lathe, one or more back rests, or supports, may be necessary to control the vibration. The device shown in the sketch was found efficient, and can be made easily. The piece B passes between the shears A of the lathe, and is held in place by a wedge, C, space being left to allow the wedge to pull. The top end of the piece B is mortised and pinned into the base, and the standard E, mortised and pinned. The front end of the arm F is V-shaped. The other end of the arm is slotted to permit lateral adjustment. The screw G, and the hole in the upright E, are threaded, and arranged to hold the arm in place. In use, the V of the arm should be kept waxed with paraffin, so that the spindle will turn easily without scratching, and the rest should be centered over the stock carefully.



Renewing Wooden Posts with Concrete

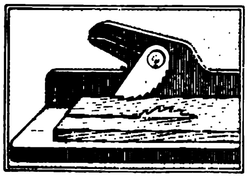
Wooden posts, supporting fences, signs, or buildings generally, decay at the ground line. It is not always possible to renew them without disturbing the structure they support, and besides, if the timber is sound except at the one point, there is a needless waste of lumber if they are discarded. To renew the life of such a post it is only necessary to remove the dirt for 6 in.

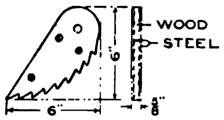


around the post. Next a wooden or sheet-metal form is made, and concrete poured in the form around the post, reinforced with iron bars, to a level with the top of the form. After the concrete has set, the post is stronger and less likely to decay farther than before the treatment.—K. M. Coggeshall, Webster Groves, Mo.

Safety Circular-Saw Guard Prevents Back Thrust

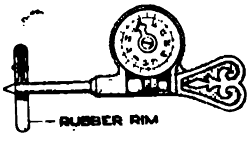
The old saying "never monkey with a buzz saw" is as sound as ever, and the careful mechanic will provide his circular saw with a guard which can be homemade, as shown. Make two steel plates, as detailed, and grind or file teeth into them on the curved edge. Drill the plates for screws and fasten them to a wooden core, permitting the toothed edge to project slightly. Various ways of clamping the guard on the saw-table fence can be devised. The dangerous back thrust of stock being cut is overcome by this guard.—L. J. Young, Cape Porpoise, Maine.





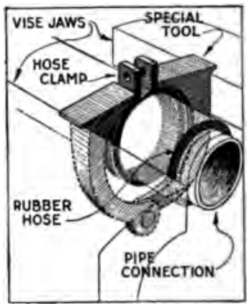
Revolution Counter Rigged to Determine Lineal Travel on Machinery

It is often desirable to know the speed a belt is traveling, or the rate of surface travel of a piece of metal being cut in a machine tool. These speeds can be easily calculated if the diameter of the surfaces and the revolutions per minute are known, but often it is inconvenient to measure one or both of them. Most machine shops and engine rooms possess a revolution counter of the type shown. A wheel, exactly $1^{15}/_{16}$ in. in outside diameter, with a rubber rim, was made as shown, to slip onto the counter in place of the pointer. This diameter is calculated so closely that it gives very accurate results. The revolutions per minute, as indicated by the counter, are timed by a watch. To obtain the distance travel of the surface in feet per minute, divide the revolutions per minute of the counter wheel by 2, which gives the number of feet per minute of surface travel, the circumference of the counter wheel being very close to 6 inches.—R. L. Hervey, Washington, D. C.



Tool for Applying Hose Clamps Handily in Vise

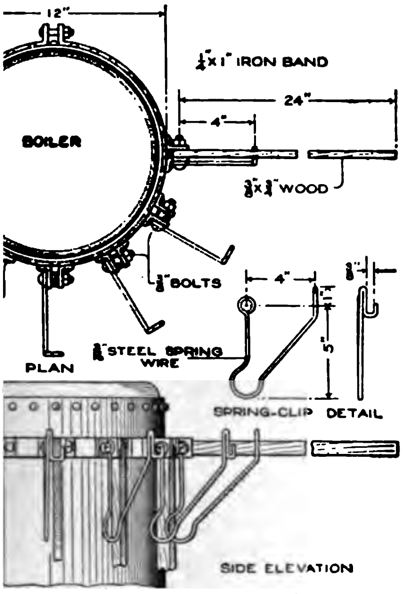
The operation of putting a clamp on a rubber hose at a connection is sometimes difficult, especially if it is an extra-tight fit and the bolt accompanying the clamp is a trifle short. In a shop where the application of clamps on hose, for the purpose of splicing, is part of the daily routine, a tool was made which simplifies the operation. The device, as shown in the illustration, is U-shaped, hinged at the bottom, and large enough to accommodate hose from 1 to 4 in. in diameter. It may be forged with but little trouble. In applying a clamp to the hose, the tool is applied so that its jaws grip the ends of the clamps, and the whole is placed in a vise. By gradually closing the vise jaws, the ends of the clamp are brought together, and a connection made easily and quickly.—L. Schoolcraft, Chicago, Ill.



¶In stenciling around the corner of the wall, use two stencils, one for straight work and the other to bend around the corner, as the bending injures the stencil.

ies Drier Attached to Kitchen Boiler

in the household usually object stringing of wash lines across chen, and the home mechanic willing to do a little work to do vith this nuisance, can provide onsiderable quantity of clothes ried by arranging a drier around chen boiler. The heat from the reduces considerably the time ry to dry the clothes. The de- ould be set near the top of the s shown. It consists of a band- ıg, which is split at one side and tightly around the boiler by of a bolt. Small angles, bent similar band iron, hold the ı strips on which the clothes are A novel feature of these sup- s the spring-clip device, shown ail, which supports the strips sed. When not in use, the strips folded down, out of the way, the side of the tank. The clips are bolted beside the left



ying of Clothes in the Kitchen is Provided his Practical Arrangement, Which Permits len Strips to be Folded Down When Not in Use

f each pair of angles, which sup- ıe wooden strips bolted between -P. P. Avery, Garfield, N. J.

Folding Table, Robe Rack, and Extra Compartment in Automobile

An ingenious method of construction and manner of stowing a folding table, and other details of luncheon equipment, is used by the owner of a light five-passenger car. The table consists of two nearly square boards, secured together by two strap hinges on the under side. Two metal slides and two screw hooks are provided for setting it up in the rear of the car, as shown. At the rear of the upper edge of the front seat, two screw eyes are secured. A leather strap through them serves as a robe rack. The hooks on the edge of the table are placed through these screw eyes, and the slides are extended, resting on the doors. The slides are wooden strips set in sheet-metal straps, fastened to the under side of the table.

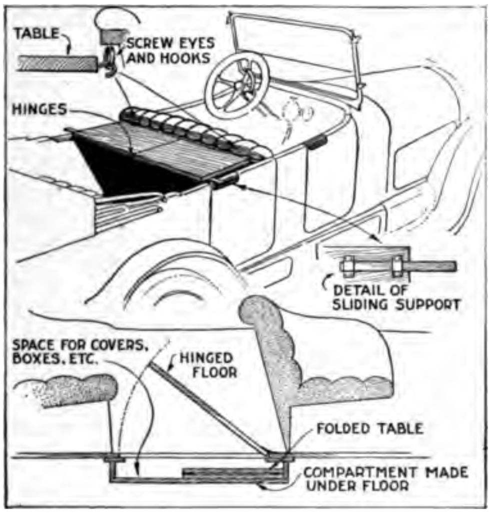


TABLE
SCREW EYES AND HOOKS
HINGES
DETAIL OF SLIDING SUPPORT
SPACE FOR COVERS, BOXES, ETC.
HINGED FLOOR
FOLDED TABLE
COMPARTMENT MADE UNDER FLOOR

The Table Is a Handy Feature, and When Folded is Stowed Away with Other Articles in the Floor Compartment

Under the rear floor of the car is a shallow container, and the floor boards have been cut out and fastened together to form a cover. The compartment accommodates the table when folded, and also other materials. The preference for eating in the car arose because of insects and other annoyances, when the luncheon is spread upon the ground.—G. A. Luers, Washington, D. C.

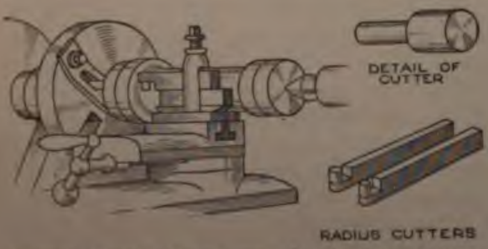
A Farm Feed and Water Heater of Concrete

An ingenious farmer made a handy cooker for cooking feed for stock and poultry. The forms for pouring the concrete were set up with rough boards. The food is cooked in an old iron kettle, under which is provided a place for a fire connecting with the chimney. The water is supplied by the pipe shown at the left. The device is thoroughly practical, and one that any farmer can build in spare time at small cost, as a permanent farm improvement.

This Concrete Outdoor Farm Cooking Stove can be Made Handily with Simple Forms

Adaptable Tool for Machining Circular Curves on Lathe

Considerable lathe work involving circular corners and grooves was done in a machine shop, and this made it worth while to design and make a set of radius cutters of standard sizes, by which the curves could be cut quickly and uniformly. The cutters were turned up in various sizes, ranging upward from $\frac{3}{32}$ in., made of tool steel, as shown in the detailed sketch. They were set in shanks of steel to fit the tool post. In use, the cutters were set in the tool post upside down, as shown; the drive belt was reversed, and plenty of oil was applied to the cutter. An accurate, smooth job resulted when the feed was carefully regulated.—Ben Frantzreb, Indianapolis, Ind.



Smooth, Circular Curves were Cut in Turned Work on the Lathe by Means of Adaptable Cutters Made in Several Standard Sizes

Fitting Gasoline-Motor Piston Rings Accurately

One of the most common causes of a lack in power of an engine is poor compression, the result of poorly fitting valves or leaky piston rings. First, there is much difference between fitting in and putting in piston rings. A method of fitting the rings, that has been found highly satisfactory, is here described.

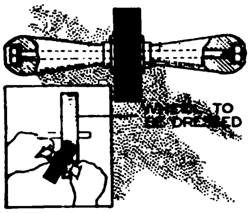
The ring, as it comes from the factory, should be a trifle oversize. First fit the ring to the cylinder, and then to the piston. A wooden piston is made, slightly smaller than the cylinder. To the end of this wooden plug, the piston ring is fastened by a strip of wood held in place by a screw. The ring should be held loosely. The inside of the cylinder is next coated with Prussian blue, then the wooden piston and ring are inserted, and moved back and forth a few times. Upon removing the ring, the high spots on the ring are bright, while the low spots are colored. The high spots on the ring should be filed down carefully, or polished off with emery cloth. After a few trials, the ring can usually be made to fit the cylinder all the way around. Attention must be given to the joint in the ring. A very small clearance, $\frac{1}{64}$ in. often being sufficient, should be left at the joint to allow for expansion from the heat.

The ring is then ready to be fitted to

the piston. The ring should be turned around in the groove, and if it binds, it should be smoothed off. To smooth off the sides of the ring it should be rubbed across emery cloth laid flat on a board, shifting it during the process. It frequently happens that an engine does not have as good compression after new rings have been put in without proper care. Proper fitting of the rings will make a surprising difference in the efficiency and power of a motor.—B. F. Bell, Waverly, Neb.

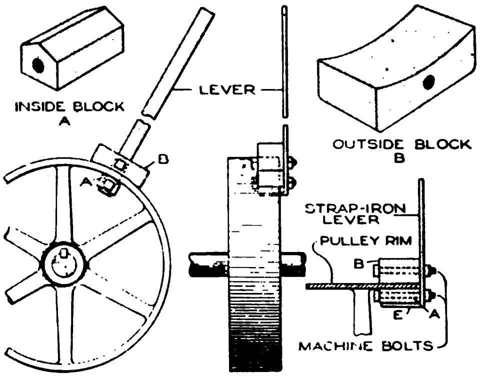
Emery-Wheel Dresser Made of Old Emery Wheel

For dressing down emery wheels, a small worn-out emery wheel is useful, when properly mounted. Set the small wheel on a large bolt, provided with two handles, as shown. Place two large washers between the wheel proper and the handles, which are held by nuts, with washers, at the ends to give slight play. In use, the small wheel is held against the wheel to be dressed, at an angle, and the handles are forced together to slow up the dressing wheel, and produce a grinding effect.—Thomas W. Benson, Hastings-upon-Hudson, N. Y.



Pulley Lever That does Not Damage Rims

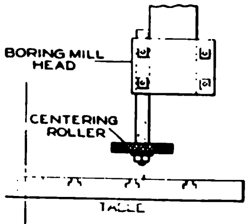
In the maintenance of machinery and mechanical power-transmission equipment, it is frequently necessary to turn a pulley, which is mounted on a shaft or machine, through a revolution or fraction thereof, to reset it. When a lever is required, monkey wrenches are often used, with a piece of pipe slipped over the handle. This method sometimes breaks pieces from the rims of the pulleys. A pulley-starting lever, which will not break the rims, can be made as detailed in Fig. 1. With this lever the stress on the pulley rim is distributed over a wide area. For best results, a different-size outside block, B, should be made for pulleys varying considerably in diameter. The blocks A and B may be made of cast or wrought iron, or even of hard wood. The lever is of strap iron, and the blocks are held to it with machine bolts.—R. C. Farrell, Chicago, Ill.



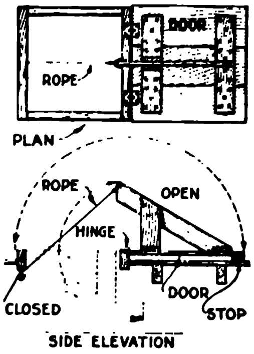
By the Use of This Lever Arrangement the Rims are Not Nicked in Resetting Pulleys

Device for Centering Work on Boring Mills

The centering of round work on a vertical boring mill is easily accomplished with the use of the roller centering device shown in the sketch. The casting is placed on the table, not bolted down, and the table run slowly, and, as the wheel on the centering device is loose, the casting is centered by moving the head horizontally until the wheel runs against the casting all the way around. Centering work on a boring mill is usually done with the aid of the cutting tool, which often results in damage to the work, but with the use of the roller there is no liability of damage from this source.—J. R. Minter, Washington, Ind.

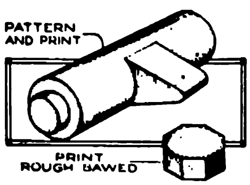


Ventilating Door on Roof Opened from Ground



A novel door made for the roof of a silo, in place of the usual type of ventilating door, and which can be opened from the ground by means of a rope threaded through pulleys, has numerous other applications. The door is hinged in the usual manner, and a wooden bracket built on its inner side, as shown. The rope is tied at the upper corner of the bracket, when the door is opened and resting on its stop on the roof. By drawing on the rope, the door is raised sufficiently so that its weight acts as a counterbalance, closing it. To open the door, the rope is also pulled, until the door is carried past the point of balance, when it again carries itself to the open position by its own weight. If the door is a heavy one, counterweights and bumping pads should be arranged for it.—L. A. Knutsen, Everett, Wash.

Simple Method of Making Core Prints without Lathe

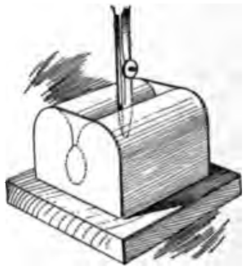


It is customary with patternmakers to turn core prints integral with the patterns themselves. At times, however, the separate print is preferred. Also, some patternmakers have no power tools besides a saw and a sand wheel. Then prints can be easily and as quickly made as in a lathe by rough-sawing the block, as shown, and sanding it down to the scribed circle. A scribed circle on the pattern locates the print.—Donald A. Hampson, Middletown, w York.

Pile of Rods Protected by Painted Stripe

A practical method of detecting if pieces have been taken from a pile of pipe, tubing, or bar stock, as often is the case especially where the material is stored in vacant lots or in shop yards, is to paint a bright-colored stripe over the pile. If pieces are taken from the pile, there will be a break in the colored stripe. This aids in placing the responsibility quickly, and cuts down the unauthorized use or theft of stock.—C. C. Spreen, Flint, Mich.

Block for Starting Flow of Ink in Ruling Pen



The ink in a ruling pen often refuses to flow, and in order to avoid the common practice of touching the point on the finger, I made a block that does the work nicely. To make it, drill a ½-in. hole in the end of a 1¾ by 1½-in. block of wood, as shown. Cut a curved slot from the top into the hole, rounding off the corners smoothly. Glue pieces of cardboard over the ends and provide a base. When the pen is contrary, push the point through the slot, and the ink is released. The block can easily be cut to fit pens of various sizes.—Walter Whitley, Lawrence, Mass.

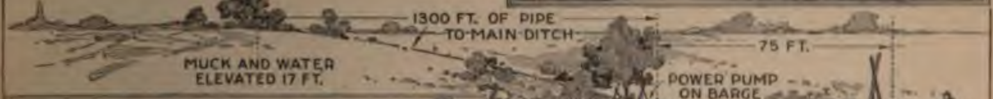
Cleaning Glass Chemical Containers

Graduates, reagent bottles, and similar vessels used for chemicals, should be cleaned thoroughly before refilling them, especially if a new liquid is used. A good cleansing agent is vinegar into which a quantity of coal dust has been poured. Fill the vessel about one-third full and shake it vigorously until the interior is polished clean. Wash the vessel in clear water, preferably distilled.

Fertilizing and Irrigating a Farm with Muck from Lake Bed

By E. R. McINTYRE

An original and successful scheme for using lake water and its muck deposits for irrigating and fertilizing an adjoining farm was used by a Minnesota farmer. There being no complete outfits on the market for such projects, he worked out his own methods which have a wide application for similar projects. The pumping outfit transfers 90 tons of muck-laden water an hour from a small lake to the farm land. Of this solution nine tons an hour is muck. The lake has about 5 ft. of water at its deepest point. The muck is from 8 to 35 ft. deep, of loose formation, and easily pumped.


1300 FT. OF PIPE TO MAIN DITCH
MUCK AND WATER ELEVATED 17 FT.
75 FT.
POWER PUMP ON BARGE
MUCK
STIRRING THE MUCK AT INTAKE

General Plan of the Muck-Pumping System, and a View of the Discharge Pipes at the Main Irrigation Ditch

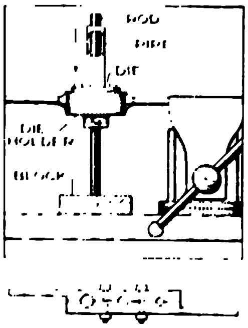
The Barge is Anchored near the Shore and Carries the Pump and Engine

The equipment consists of one 7-hp. kerosene engine, a 3½-in. centrifugal pump, intake pipe, and a pipe used to carry the water from the pump to the highest point of land whence the distribution is through open ditches and furrows. While the pump is in operation, a man in a boat about 100 ft. off shore agitates the lake bottom occasionally with a long-handled rake, to stir up the muck.

Engine and pump are fastened to a small barge, as shown in the lower photograph. Connecting with the pump are two lines of pipe. One draws the muck and water into the pump, and the other transfers it in turn to the land. The intake pipe of wood is kept at the bottom of the lake by means of weights. A 6-in. pipe is fastened to the wooden pipe and may be swung in various directions. With added pipe the supply of muck is readily extended.

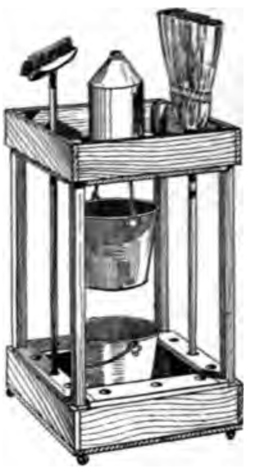
To keep out stones and sand a special device is used. A box, measuring 3 by 3 by 5 ft., is placed between the pump and the intake pipe. This catches the extra large particles and keeps them out of the pump. The water and muck are taken to the highest point on the farm, 650 ft. distant, with a rise of 17 ft., by two lines of 1-in. pipe. These are fastened to the exhaust openings of the pump on the barge. Old boiler flues are used for these pipes. Instead of piping outward from the highest point on the farm, ditches were dug, and the strawberry beds and orchard irrigated in this way. On kerosene, the cost of operation is about 10 cents an hour, the muck thus being deposited on the land at a cost of 10 cents a ton, exclusive of labor and repairs to machinery and the initial cost of $250 for the equipment.

Cutting Threads Accurately on Small or Thin Pipe



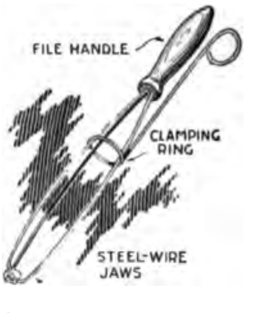
In cutting threads on thin or small pipe it is often troublesome, especially on short pieces, to get the threads square with the length of the pipe. There is also trouble in getting a suitable grip on the pipe so as not to bruise or scratch it if plated. A good method is to put the die holder in a bench vise, and reverse the dies, that is, turn them upside down. This will make a piece of pipe thread in the direction of the arrow. Select a piece of steel rod of a size to just slide through the pipe. Run this down between the dies into a block so fastened as to make the rod vertical. Slide the pipe down over the rod and it will be threaded straight and true. The best grip I have found is shown in the smaller sketch. Select a piece of hard wood, 1$\frac{1}{8}$ in. thick and 15 in. long. Shape it as shown, and bore a series of holes along a center line, of sizes to take the outside diameters of the pipes. Then bore two $\frac{1}{4}$-in. holes for bolts. With a thin saw, cut along between the pieces. When clamped on the pipe, this ce will not slip or bruise it.—L. M. e, Daytona, Fla.

Portable Stand for Janitor's Cleaning Equipment



A stand, on casters, and built to accommodate the various articles that a janitor uses in cleaning rooms and halls in large buildings, is a time and labor saver. It is made to fit a hall closet, and can be kept out of sight easily when not in use. Painting it with white enamel gives a neat appearance. When needed, the janitor rolls the stand to the room he intends to clean, leaving the stand just outside. The casters should be of the pivoted roller type, and for use on highly finished floors larger, rubber-covered caster wheels are desirable.—Thomas O'Dea, New Haven, Conn.

Tool for Grasping Small Machine Parts



Four pieces of steel wire and a file handle are all that is needed for the construction of a handy tool useful for setting bolts, nuts, screws, etc., in places difficult of access. It is also convenient for recovering coins, rings, washers, etc., from plumbing fittings. The tool is made by driving into the file handle three steel wires, in prong fashion. A wire is made ring-shaped, to slide over the prongs and compress them about the piece to be handled. The length of the prongs will vary to suit the needs of the individual user.

Shaft Hangers and Fittings for the Small Shop

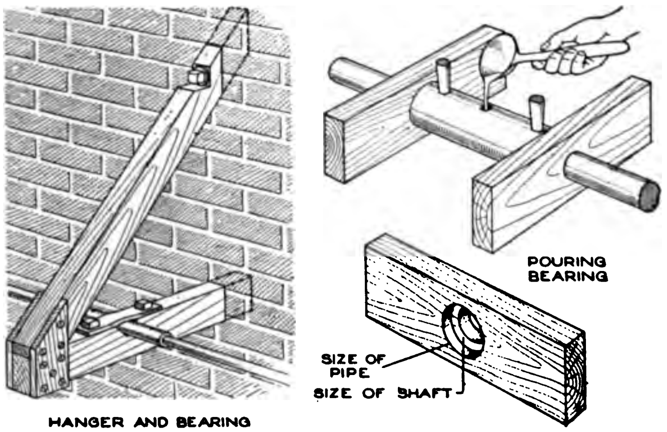
When it was found too expensive to buy hangers for a shaft in a small shop, they were improvised, and proved so serviceable that they were left in place as permanent equipment. Six of these hangers carry a 1-in. line shaft, 34 ft. long. The method of construction is simple, and the parts used can be obtained in most small shops.

Cold-rolled steel is used for the shaft. The bearings are made of short sections of gas pipe, into which babbitt is poured. The bearings require a 1¼-in. pipe, cut from 4 to 6 in. long, depending on the load to be carried. After the pipe is cut with a hacksaw to give a square end against which collars can be fitted, the sections are bored with three holes, as shown in the sketch. Two of the holes are oil holes, and the center one is for the pouring of the babbitt.

The pouring of the babbitt is accomplished by means of two wooden supports, bored, as shown, to fit the shaft, and shouldered for the pipe. The arrangement is set up as indicated, the oil holes being plugged, and the babbitt is poured into the bearings. The bearings are smoothed and cleaned in the usual manner. If the shaft and pipe are warmed slightly, a better job will result.

The method of hanging the bearings can be arranged to suit conditions. In this instance the shaft is run along the wall, and the hangers are made of wood, strongly braced, and set into the wall, as shown. The bearing is clamped into a V-groove by means of a metal plate.

The wood pulleys to transmit the power from the shaft are made by building them up of alternate layers of ⅞-in. wood, which are cross-banded, and fastened with glue and bolts. The pulleys can be turned true by mounting them on the shaft, and rigging up a suitable rest for the turning chisels. Collars for holding the pulleys and other fittings on the shaft, can be made up of short sections of pipe, drilled and tapped for setscrews. To guard the setscrews, they should be short, and the threaded collar covered with a second collar, bored so that the head of the setscrew is recessed in a socket, and the covering collar cut to form a split ring. Suitable setscrews may be made by cutting off the threaded end of a bolt, and slotting the upper end to engage a heavy screwdriver.—Ray F. Kuns, Cincinnati, Ohio.



Equipment for Power Transmission in the Small Workshop can be Made Cheaply by Using Babbitted Pipe Bearings and Hangers Built Up of Wood

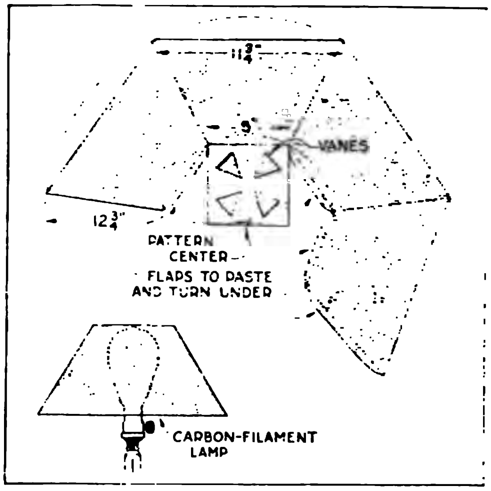
---

Small Wire Scratchbrush Handy in Soldering

In soldering teakettles, pans, etc., it is often difficult to clean the surface to be soldered, especially on the inside of the vessel. This trouble can be overcome by using a file cleaner with long steel-wire bristles. If the cleaner is too large, cut some fine steel wires, form them around a small brass rod, bind them securely with a piece of brass or copper wire, and then sweat a little solder in around them. Such a scratchbrush will give good service for cleaning small areas.—A. Gemmell, Ansonia, Conn.

Window Lamp with Revolving Shade Attracts Attention

The animated window display described is automatic and requires no driving mechanism. To make the revolving shade, cut from light, strong cardboard, a form, as shown. The sides may be cut with stenciled letters or designs, backed with translucent paper, or may be left solid. Four triangles are cut in the top, and the resulting vanes are bent downward at right angles. A small paper disk is then pasted in the exact center of the under side of the top, and a small hole centered in it. Mount a large carbon-filament lamp on a suitable pedestal, pivot the shade on the tip of the lamp, and turn on the current. The heat generated will flow up between the vanes and slowly turn the shade as long as the current is turned on.—B. L. Dobbins, Boston, Mass.



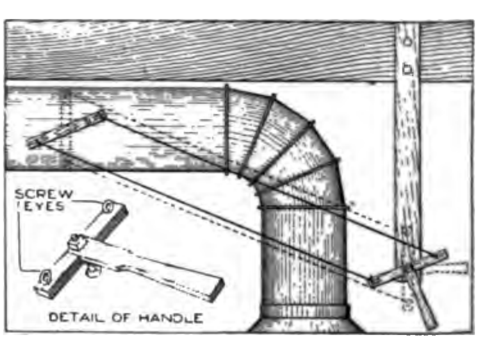
The Heat Generated by the Lamp Turns the Shade, Which is Pivoted on the Tip of the Globe

Cutting Hard Sheet Rubber with Scissors

Hard sheet rubber is difficult to cut, and the average experimenter has few facilities for doing such work. An easy way to cut this material, up to 3/16 in. thick, is as follows: Mark the outline to be cut on the rubber with a scriber. Plunge the sheet into hot water; take it out and cut on the outline with a pair of heavy scissors. The rubber will become soft like leather and will cut easily. As it becomes cooler, it will cut harder. If any more cutting is to be done, plunge it into hot water again, and continue until the cutting is finished. The sheet will probably be somewhat out of flat. To remedy this, dip the rubber in hot water, place it on a sheet of plate glass, or metal, and put another sheet of glass over the rubber, with a weight on it. Permit it to cool, and it will be flattened.—W. S. Standiford, Youngstown, Ohio.

Device for Opening Stove Damper Handily

It is often inconvenient to get near enough to a damper in a stove or furnace to open and close it. To overcome this difficulty I arranged a simple device, as shown in the sketch. I first made four pieces of wood, 7/8 by 1/2 by 6 in., and two of them were halved together in the form of a "T," as detailed. On the ends of the crossbar I inserted screw eyes. The other two pieces I fastened on the handle of the damper with two screws, and also put screw eyes in the ends of one of these pieces. To the floor joist I nailed a brace long enough to be within easy reach of a person standing in front of the furnace. On this brace I pivoted the T-shaped piece, as shown. Parallel wires connected to the eyes, as



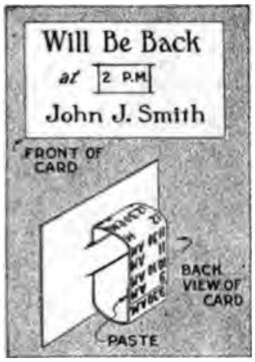
This Arrangement Made in Half an Hour Is a Great Convenience at the Furnace indicated, completed the arrangement. By means of the T-shaped piece I can move the damper readily from the front of the furnace.—Walter S. Jennings, Buffalo, N. Y.

Chipped Grooves Drain Rainwater from Walk Depressions

After several years, stone and various composition walks begin to wear away on the surface. Depressions form near the center of each square of walk, and after a rain pools of water settle in these depressions. A remedy is to chip a small groove from the low spot to the side of the walk, to afford drainage for the water.

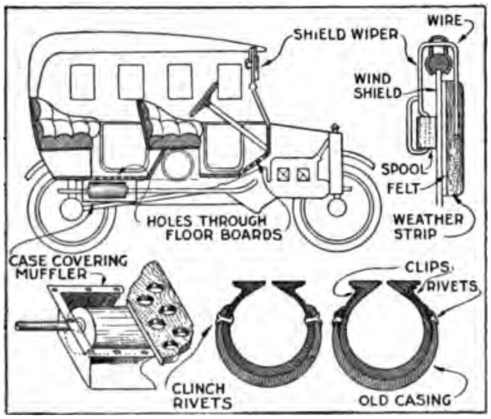
Variable "Will Be Back" Sign Quickly Made

To save time in answering telephone calls for men who are out of the office, a clerk in a large organization devised an inexpensive device to tell when each man expects to be back at his desk. Across the top of a 3 by 5-in. filing card is lettered "Will Be Back at," and below this is the name of the man for whose use the card is intended. Two horizontal slits, 1½ in. long, are cut in the middle of the card about ½ in. apart, as shown. A fairly stiff piece of paper about 8 in. long is slid through these slits. On this strip the office hours, divided into half-hour periods, are indicated. The ends of the strip are pasted together forming a support for the sign. When John Smith intends to leave his desk at 10:00 a. m. for an hour, he simply slides the stiff paper through the two slits until "11:00 a. m." appears on the face of the card. This device makes it unnecessary to bother several people to ascertain when he will be back.



Devices That Add Comfort to Winter Touring

Winter automobile touring or driving, without special preparation, subjects the tires of the car and its occupants to unusual severities. With comparatively slight labor, protection may be provided that will also decrease expenditures for tires. Excess heat, usually lost in radiation, can be diverted to portions of the car to the comfort of the occupants. The method shown in the sketch is effective. Construct a boxlike case for the muffler, and fasten this to the under side of the floor. The casing may be of sheet metal or wood. Through the floor, directly above the deflector, a number of holes should be bored, which will not materially weaken it, yet will permit the heat from around the muffler to escape into the car. The floor boards in the front compartment may be drilled in a similar manner for the heat from the radiator and engine.

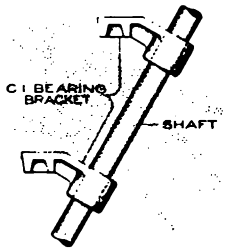


These Homemade Devices and Features Are Practical for Winter Touring or Driving. The Car is Warmed, the Tires Protected, and the Windshield Kept Clean

Tires should be protected from the frozen roadbeds. Discarded casings will render efficient service as covers, taking most of the punishment of the winter roads, and also increasing the tire diameter and bearing surface, thus making progress through the snow less difficult. The heads of the casings are removed. Coppered clinch rivets hold the casings securely in place, as detailed.

Another convenience, when driving through snow, rain, or mist, is a home-made windshield wiper. One made of a piece of felt-edged weather stripping, mounted on a bent rod of spring wire, as shown, is practical. The clip is made of sheet metal, fastened by means of a small bolt, and, on the other end of the wire, a spool, with flanges removed, is mounted. If the felt edge is occasionally saturated in equal parts of glycerin and alcohol, it will coat the glass with an oily film, which tends to shed water and makes necessary only occasional use of the cleaner.—G. A. Luers, Washington, D. C.

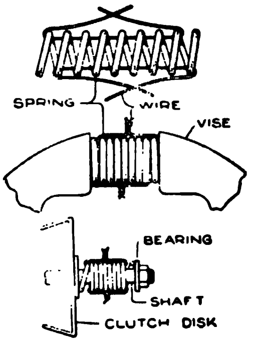
Fitting Angle-Shaft Bearing Brackets to a Machine



A shaft to be placed at an angle on a machine in bearing brackets, as shown, requires considerable fitting to get the brackets in line, so that the shaft does not bind. To avoid this trouble, the bearing brackets should be bored out ½ in. larger than the diameter of the shaft. The brackets are secured to the machine; small collars, ⅛ in. wide, are provided to slip over the shaft, their outside diameter being the same as the bore in the bearing brackets. These collars are placed in position to enter the holes in the bracket, centering the shaft. Babbitt is poured through a hole drilled in the hubs of the bearing brackets. The babbitt will run around the shaft, locating it easily. It is only necessary, after removing the shaft, to scrape the inside of the bearings and drill an oil hole.—Jos. Limbrunner, Shelton, Conn.

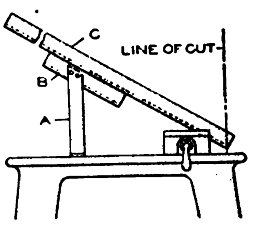
¶In clamping smooth work on machine-shop machines, the slipping of the metal on the surface of the machines can be overcome by inserting a sheet of paper between the work and machine bed.

Replacing a Strong Coil Spring



Great difficulty is often encountered in replacing the clutch spring on an automobile, or other strong coil springs, which must be compressed. The operation is frequently dangerous, especially for one man. By binding the spring with wire, as shown in the sketch, and clamping it in a vise, one man can replace the spring quickly and safely. Two pieces of wire are inserted in the spring, which is then clamped in the vise. The wires are twisted and drawn up tightly. Then the spring is set into place, and, when the wires are cut, springs to its proper position.—Ralph M. Brown, Ithaca, N. Y.

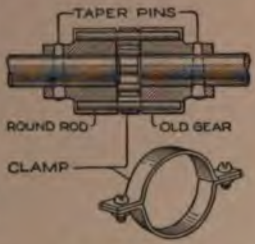
Channel Bars Mitered in Power Hacksaw



In making a large frame out of channel iron, the ends had to be cut at an angle. The rigging, shown in the diagram, was made to line up the channel irons for cutting. The upright A is fastened to the bed of the hacksaw, its lower end being bent at a right angle. The strip B is fastened to the upright A at such an angle that, when the channel iron rests against it, the end will be cut off at the required angle. The channel iron C is held against the strip B with a wooden clamp. The rigging should be in line with the vise so that the lower end of the work may be clamped in the vise. This method saved much time as against doing the work by hand.—C. Anderson, Worcester, Mass.

ly Made Shaft Coupling

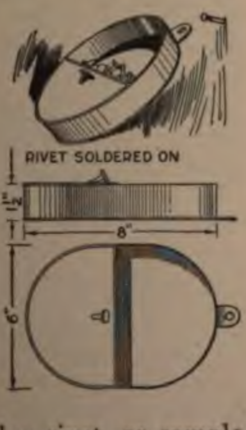
gears from the shop scrap
used to make a shaft
which
quite
. It
con-
ectric
small
pump
nental
gears
ed to



y means of standard taper
wn, after which a series of
pins were placed in the
een the teeth. These pins
h diameter as to allow them
spaces snugly. A clamping
le in two sections as de-
slipped over the pins, hold-
ter firmly in place. The
s proved efficient, and also
antage of being readily dis-
—A. L. Snell, Minneapolis,

ckets for Storing Rivets
d Small Hardware

l of storing rivets, used by
has many practical adapta-
e home workshop, as well
op or
store.
nith
ies of
poc-
wn in
6 in.
8 in.
n eye
to be
nail,
hook,
rge
n the
the
each



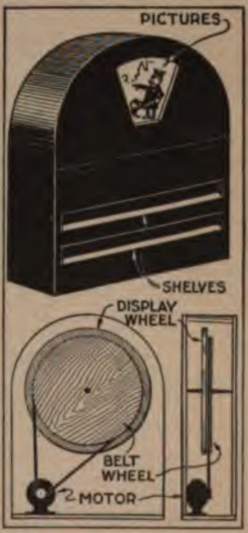
soldered a rivet, or sample
small article was contained
icular pocket. When used
ench, the pockets are laid
g the contents.

Thawing Out a Fire Plug Quickly

When the fire department was called out one night to a serious fire, the street fire plug was frozen, and ordinary remedies failed to open it promptly. While some of the firemen attacked the blaze with chemicals and what water was available, others poured gasoline, from the tank of the fire truck, over the frozen plug and set fire to it. The plug was soon thawed out, and the fire brought under control.

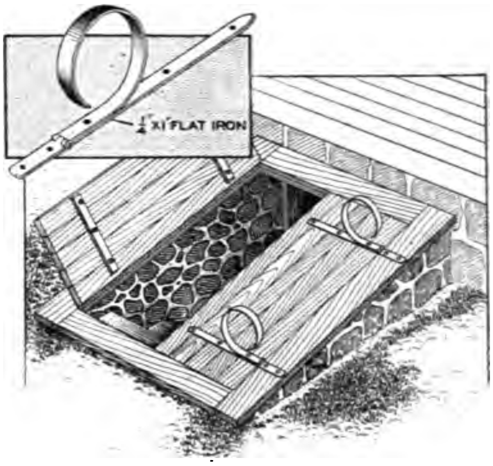
Novel Display Wheel for Show Window

A window advertising novelty which attracted considerable attention, was homemade of inexpensive materials, and driven by a small motor, the whole arrangement being compactly inclosed, as shown in the illustration. A good size for the case is 15 in. high, 3½ in. deep, and 12 in. wide, with a disk about 10 in. in diameter made of two ¼-in. boards. The smaller disk is used as a pulley, and is belted to the motor by small round belts, or cords. Cartoons, or similar devices, with advertisements between them, are mounted on the face of the disk, which can be covered with velvet or other attractive material. The wheel is driven around making the onlooker curious to see the various figures that appear in the opening. Two narrow shelves may be set into the front of the box, as shown, for displaying rings or other small articles. The front of the case is hinged as indicated, so that the disk can be re-covered as desired.



Combined Hinge and Stop for Cellar Doors

Strips of flat iron, ¼ by 1 in. wide, were used to make serviceable hinges for cellar doors, and a strip was attached to each hinge, curled in the form of a spring, as shown, providing also a practical stop. The usual difficulty with such doors is that the hinges are soon torn loose and the doors racked to pieces. These hinges act as braces across the doors as well as stops.—M. E. Duggan, Kenosha, Wis.



These Combined Hinges and Spring Doorstops Strengthen the Doors, and Keep Persons from Walking on Them

Proof on Letter-Printing Machine Made with Carbon Sheet

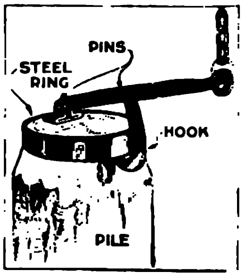
A simple way to obtain a proof sheet of a letter that has been set up for running on a letter-printing machine, without going to the trouble of attaching and detaching the ribbon and getting the fingers full of ink, is to lay a piece of carbon paper on top of the letterhead with the carbon face in contact with the letter, and then feed the two sheets through the machine together. The result will be a legible carbon copy in which all errors are readily found. On account of the extra thickness of paper, the lever regulating the impression should be properly adjusted.—Alfred J. Miller, Albuquerque, N. M.

Broken Motorcycle Nut Repaired on Road

While on a motorcycle trip, far from a repair shop, one of the main nuts on the rear axle of my machine broke in two. It was an odd size, and I could not get another. Finally I clipped a loose end of heavy wire from a near-by fence, filed a V-groove around the edge of the nut on the six corners, and twisted the wire tightly around the nut in the groove. When screwed into place on the axle, the nut held satisfactorily until I arrived home.—W. H. Thies, Washington, District of Columbia.

Hook for Removing Cap Rings from Piling or Posts

In driving posts or piling, a steel ring is usually set over the top to prevent damage to the post from the blows of the hammer, or pile-driver head. Where a number of stakes are driven, it is also convenient to use a ring which may be removed and used repeatedly. The device shown in the sketch can be made in various sizes for removing these rings quickly. On large jobs, power may be applied to the drawbar, and on smaller posts a lever may be hooked to the chain, or the bar may be made long enough to give good leverage.



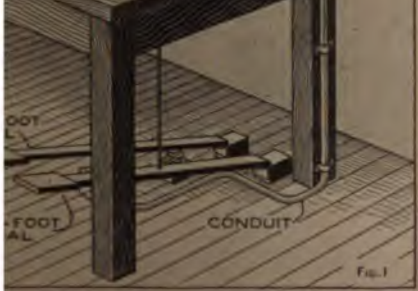
Surfacing Typewriter Platens with Sandpaper

When rubber typewriter platens become hard and uneven they can be made soft and smooth by turning them with coarse sandpaper, and then smoothing them with fine emery cloth. They will then be almost like new, thus avoiding the poor writing caused by hard and uneven platens.

An Electric pot-Welding Machine

BY K. M. COGGESHALL

ECTRIC spot welding is rapidly
eplacing riveting as a means of
nently holding together two or
sheets of metal for many kinds of
The electric weld is more
y made than the riveted joint; it
ot loosen, and is nearly as strong
urable as the material itself, if
ly made. For this work a spe-
achine is necessary. The sheets
welded together are placed be-
two copper electrodes, as shown
heading illustration and detailed
assembly sketch and working
ngs. A large current, at low
e, is then made to flow from one
de to the other, passing through
tervening metal sheets. As these
, which are generally of iron,
much higher electrical resistance
the copper electrodes, they in-
become hot at the points where
ctrodes touch them. The hotter the metal becomes, the greater is the resistance. Finally, the iron sheets are brought to a welding temperature, and a very slight pressure forces the molten metal together, forming a perfect weld at the point of application of the pressure.



Range of Spot-Welding Work can be Done
is Homemade Outfit, the Current for Which
from the Ordinary 110-Volt Lighting Circuit

The constructional features of a modern spot-welding machine for high-speed factory work are quite complicated, but a simple, homemade machine may be built for the small shop at slight expense and without the use of special tools. A machine of this type is shown in Fig. 1. There is no danger of getting an electric shock in operating this machine, the pressure being only three volts, or little more than that of a dry battery. The transformer will stand an instantaneous overload of 400 or 500 amperes on the secondary, which is plenty for small work.

A heavy table, or workbench, serves as the support for the welding apparatus. Near the edge of the table is fastened a wooden block, about 6 in. high and 4 in. square. This forms the support for the bottom electrode, which is held in position by an iron holder fastened to the block by screws, as shown in Fig. 2. The flat bar A is only 1/4 in. in thickness, and cannot provide sufficient holding surface for the electrode B. Accordingly an iron block, C, 1/2 by 2 by 3 in. long, is bolted to A, the electrode being set through it and held by means of a setscrew.

The upper electrode is adjustable up

and down only, with no lateral movement. This is accomplished by bolting the electrode holder D to a flat iron bar, E, as shown. The electrodes must never be permitted to come together while the machine is operating, and as a safeguard a block, F, is provided with a coil spring inserted between it and the bar E. This spring holds the electrodes 4 in. apart.

For the mechanical control of the machine, a right-foot pedal is used. This pedal is connected to the bar E by a wire controlling the position of the upper electrode. The construction of the transformer is next undertaken. A direct-current supply is seldom used for welding, and the alternating current used requires a suitable transformer. It is assumed that the lighting-circuit supply is 110 volts and the frequency 60 cycles, which is the form of current in general use. The transformer consists of two windings on an iron core, as detailed in Fig. 4.

The first winding, connected to the supply circuit, is called the primary, while the other winding, which in this instance is connected to the electrodes, is the secondary. Current flowing in the primary winding will induce a voltage in the secondary directly proportional to the number of turns of wire in each winding. For the making of the core several thin sheets of iron are cut into strips, 7½ in. long and 1½ in. wide, as shown. A sufficient number should be prepared to give two piles, each 1½ in. high. Cut the same quantity of 1½-in. strips, 3½ in. long. These strips are then annealed. Using the longer strips, proceed to build up the pile. The second strip is laid on the first so that it overlaps it at one end by 1½ in. The third strip is then placed on the second, directly over the first one, as shown. The fourth strip laps the third, lying directly over the second, and so on, to complete the pile. It is then bound temporarily with tape. Two such piles are required. The same procedure is carried out with the 3½-in. strips.

From thin fiber or strong wood, cut four end pieces, 3 in. square, with holes through the centers, 1½ in. square, as shown. Slip two of these end pieces on each of the long piles of strips, and secure them in position. Between these ends several layers of linen, or friction tape, are wound on the core for insulating purposes. A coat of shellac is then applied. When the shellac is dry, neatly wind on each of these two bobbins two layers of 63 turns each No. 14 gauge, double cotton-covered wire. This forms the primary winding. After giving the primary winding several coats of shellac, wind on three layers of tape, taking care that the work is neatly done as this insulation must be perfect. Again apply shellac.

Upon this insulation is wound the secondary, for which heavy wire is used. On each bobbin wind two coils of seven turns each of No. 6 gauge, double cotton-covered wire. An outside covering of tape is put on to give the coils a finished appearance. With the two wound bobbins lying side by side, sandwich the other two packs of laminated strips into the ends of their cores, so that a continuous core in the shape of a hollow square is formed.

In making connections great care must be exercised. Reference to the winding and wiring diagrams, Figs. 5 and 6, should be made, noting that the two coils on the primary are connected in series, while all four secondary coils are in parallel. The outside connections are quite simple. Two heavy cables carry the current from the secondary to the electrodes to which they are soldered, as shown in Fig. 2. The primary winding connects, through a pedal-control switch, to the 110-volt lighting circuit. A knife switch and fuses may also be inserted in this circuit if desired.

The pedal-control switch arrangement, shown in Fig. 3, is similar to the mechanical control pedal, except that, when the pedal is depressed, electrical connection is made in a quick make-and-break switch with snap action. The switch is inclosed in a metal case and set in a wooden block fixed to the floor. A heavy coil spring raises the hinged pedal when it is not held down

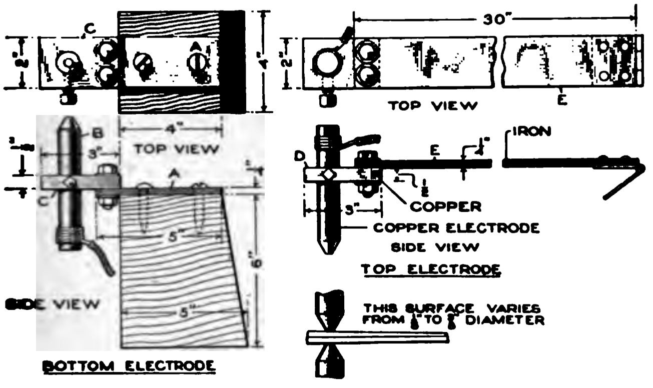
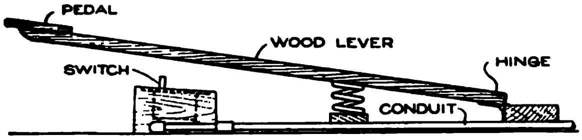
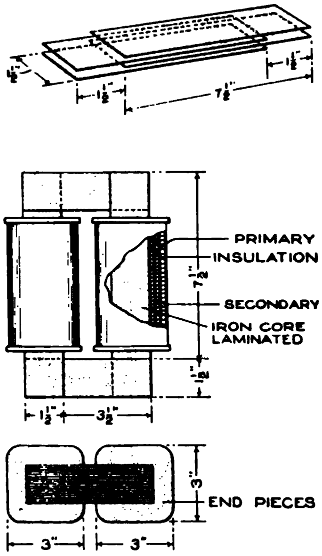


Fig. 2



DETAIL OF LEFT-FOOT PEDAL
Fig. 3



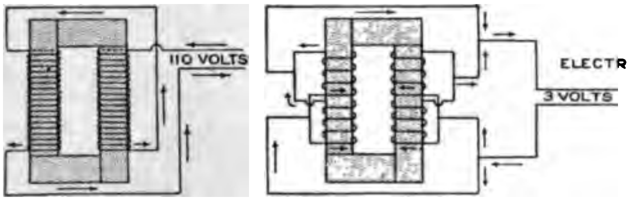
DETAIL OF TRANSFORMER
Fig. 4

Details of Construction: Fig. 2 Shows the Details of the Electrodes and Their Fittings; Fig. 3, the Arrangement of the Pedal Control of the Switch, and Fig. 4, the Details of the Transformer

by the foot. Copper rods are used for electrodes, their diameter being about ⅝ in. The welding end is tapered to a surface varying from ⅛ in. to ⅜ in. in diameter, depending on the work to be done.

Several trials are necessary before successful results are obtained in the use of the machine. The operator should sit down to work the machine so that both feet may be used to control the pedals. After fitting the two sheets together in the exact position desired, they are placed between the electrodes. With the right-foot pedal depressed, the electrodes are brought in contact with the material, and a slight pressure applied. The left-foot pedal is then depressed, allowing the current to flow for several seconds. The localized current heats the metal sheets to a welding temperature, and with a further pressure on the right pedal, the sheets are forced into close contact and the weld is made.

In conclusion, several kinds of metal can be satisfactorily spot-welded. Copper and aluminum are exceedingly difficult to weld, as they offer low resistance to the flow of an electric current. Galvanized iron may be welded satisfactorily, although the zinc will be burned off at the point of the weld. Tin can be welded to tin, or to sheet iron, as may also brass. Sheet iron to sheet iron gives the best weld.



PRIMARY WINDING SECONDARY WINDING

Fig. 5

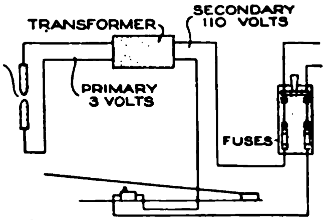
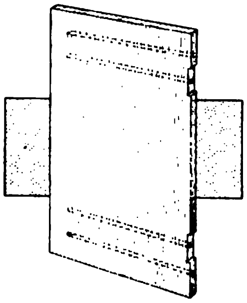


Fig. 6
WIRING DIAGRAM

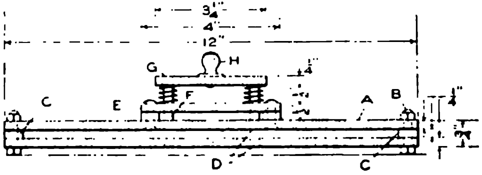
The Winding and Wiring Diagrams should be Studied Carefully, so That No Mistake is Made in Making of the Transformer and the Hooking-Up of the Wiring Connections

Quick Method of Making Small Doors



Small doors made of several pieces of board, extending vertically, usually require cleats on the back to keep them from warping. A panel door for the purpose is often too expensive, or too troublesome, to make. An attractive and substantial small door can be made by taking two, three, or more pieces and stringing them on dowels, seated in holes bored through the several pieces, as shown. This method is practical in making doors up to 18 in. wide. Match the boards together and nail strips on, to keep them straight. Put the rough door in the vise, mark the places where the hinges will go, and with a long ⅜ or ½-in. bit, bore through the pieces successively, to within 1 in. of the edge of the end piece. Cover the dowels with glue, and drive them home. The bit must be sharp, and the grain must be observed in order to avoid boring through the side.—Henry Simon, Laguna Beach, Calif.

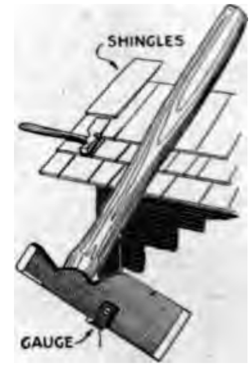
A Perforator for Loose-Leaf Book Fillers



A Homemade Perforating Punch of This Type can be Made Easily, and Is Useful Especially for Loose-Leaf Sheets

Having a set of loose-leaf books, I made the perforator shown, instead of punching the holes with a plier-type hand punch. It perforates 10 sheets of ordinary paper at one time. To make the device, cut two pieces of ¼ by 1-in strap iron, A, and drill 3/16-in. holes, B, in them. Drill holes, D, suitably spaced, for the punch rods F. Bolt pieces, A, together, as shown, with ¼-in. strips, C, between them, at the ends. Make the piece E as detailed, and drill holes to match those at D and also holes for the bolts at the end. Fit strips under the ends of the piece E. Thread the steel pins F at one end. Cut and drill the strip G as shown. Thread holes in strip G, and set the threaded pins in place. Fit a wood or metal handle, H, to the piece G. Assemble the parts as shown, and fit open coil springs, ½ in. long, between the plates G and E. Grind off the lower ends of the pins F, so they just come through the top plate A, grinding them at a slight angle to give a shearing effect. The sheets of paper are placed between the plates A, and a sharp blow with the hand on the handle H drives the pins through, cutting neat holes.—Bert Waychoff, Fort Collins, Colo.

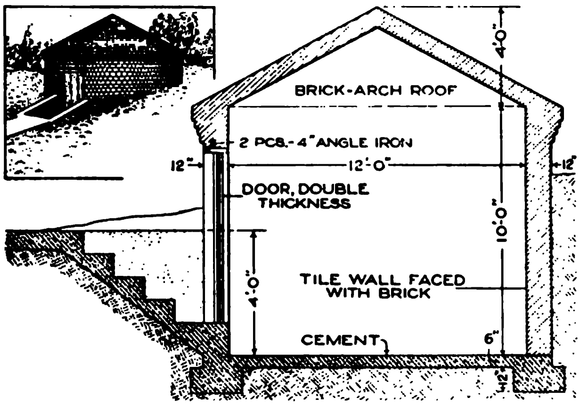
Shingles Set by Gauge on Shingling Hatchet



It is desirable when working on a roof, or other similar place, that as few tools as possible be required for the work. In shingling, this is especially necessary, in order to make speed. A kink that will save much time is the fitting of a small gauge on the front edge of the shingling hatchet, as shown in the sketch, to measure the weather exposure of the shingles. The gauge is a small U-shaped strip of iron, with a setscrew in one side of it, by means of which it is clamped at various positions on the hatchet.—C. J. Shields, Indianapolis, Ind.

A Round Storage Cellar for the Farm

ı round storage cellar has attractive :ures as to practicability, inexpen- : construction, and the securing of ximum storage space. That shown ; built of brick, but various ds of masonry materials, or crete, could also be used. : inside diameter is 12 ft., : the height from the floor :he ceiling line is 10 ft., giv- a good-sized cellar for the rage farm. The cellar is lt largely underground, and area surrounding it is ded up, after the wall is ıpleted. The floor, the wall ndations, and the steps are :oncrete, made of a mixture one part cement, three of d, and five of gravel. The ting is heavy, and the floor · in. thick, with a 2-in. bed :inders or fine gravel. The walls 12 in. thick, and can be made satisfactorily of 8-in. hollow clay tile, faced with common brick. This gives a desirable double air space in the walls. The door should be 3 ft. wide and 7 ft. high, made in double thickness of matched lumber, with heavy roofing felt between the boards to provide insulation against heat and cold.—W. F. Frudden, Charles City, Iowa.



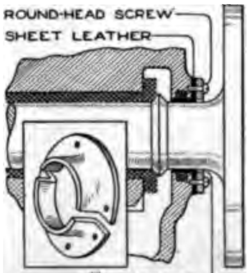
A Good Storage Cellar Is a Worth-While Investment for the Farmer, or Even for the Home Gardener and Fruit Grower

ement-Bandage Repair on Large Pipes or Cylinders

'or mending leaks in irrigating :s, cracked pumps or cylinders, .m-heating pipes, etc., a bandage of .ent and cloth makes a good job. : Portland cement and water to a :e; next take a long strip of loose- 'en cloth, burlap, or cheesecloth, ι. wide, and roll it into a roll like ırgeon's bandage. Work the loose full of the mortar, and wind it ınd the leak, taking a handful of cement mortar and working it well ı the cloth, at each round. Con- .e until the bandage is 1 in. thick; ı finish over the surface with the 'tar, and let it stand for 48 hours, l protected from wind and sun. It then be ready for use. If there heavy pressure in the pipes, wrap : mesh around to reinforce it. I e mended leaks in 8-in. irrigating : with a 20-ft. pressure, both wooden iron, by this method.—D. H. Snow- ger, Payette, Ida.

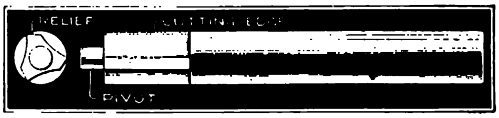
Leather Angle Washers Stop Oil Leakage in Crank Case

It frequently happens that the oil in the crank case of a gasoline engine leaks out through the ends. This was the case on the engine of my automobile, and I eliminated the trouble in the following manner: I took a piece of 1/8-in. leather and made a tube of it, the inside diameter being equal to that of the bearings and its length 7/8 in. It was then placed on an arbor swedged back to the shape shown ir the illustration, and cut into halves Both halves were placed into position as shown, and two small semicircula segments of a flat ring were screwe on, holding the leather in positio A. K. Rudolph, New York, N. Y



Counterbore Ground Quickly from Round Stock

Often the mechanic in the machine shop requires a special size of counterbore and does not find it in his stock of tools. A quick method of supplying such a bore is to take a piece of tool steel and turn it to a shoulder pivot, as shown in the sketch, and then grind it to the proper cutting edges. The grinding can be done readily on an ordinary emery wheel, and care should be taken to provide the necessary relief at the cutting edges. The pivot, of course, must be made of the proper size for the center hole, and the lower cutting edges of the counterbore should also be given a relief toward the back.

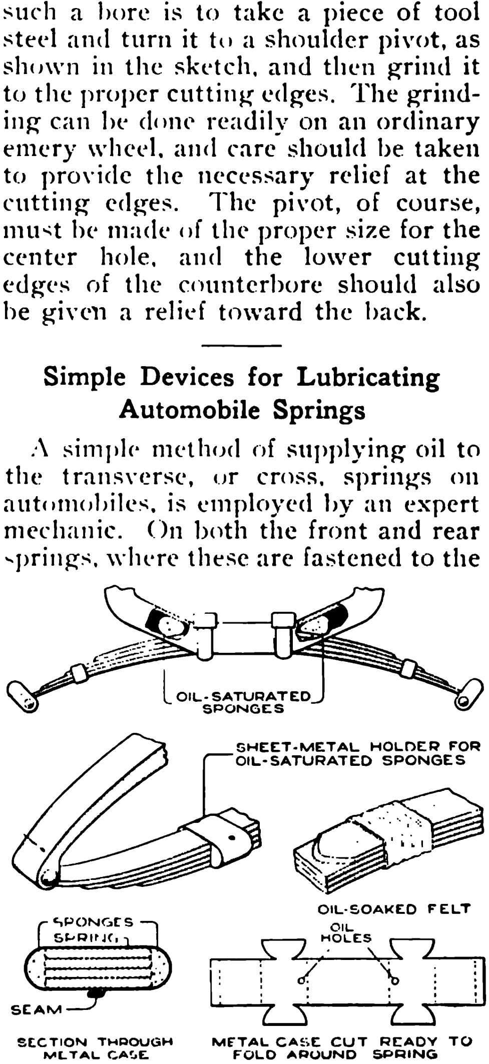


A Counterbore of This Type can be Ground Quickly from a Piece of Tool Steel, Which is Then Properly Tempered

Simple Devices for Lubricating Automobile Springs

A simple method of supplying oil to the transverse, or cross, springs on automobiles, is employed by an expert mechanic. On both the front and rear springs, where these are fastened to the channel frame, forming pockets, he placed small sponges soaked with oil, as shown. When the springs are deflected, the oil flows onto the springs, keeping them lubricated and free from rust. Occasionally the sponges are removed and the oil supply replenished.

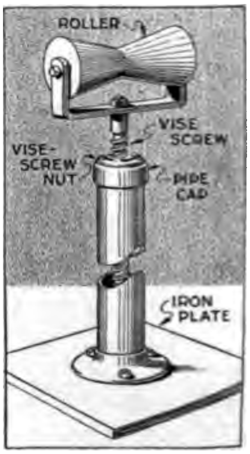
Another good method for elliptical, or semielliptical springs, is to use strips of felt, or other porous material, binding this neatly around the spring with twine, and pouring oil over it. The felt is covered with waterproofed cloth or leather. A lubricator, as shown, can also be made, of tin or sheet brass, for inclosing small sponges, which are held to the edges of the blades, on springs of these types. This attachment, as detailed in the pattern, can be either folded over at the under side, into a seam, or flanges may be left to fasten with a screw and nut.—G. A. L., Washington, D. C.


OIL-SATURATED SPONGES
SHEET-METAL HOLDER FOR OIL-SATURATED SPONGES
OIL-SOAKED FELT
SPONGES
SPRING
SEAM
OIL HOLES
SECTION THROUGH METAL CASE
METAL CASE CUT READY TO FOLD AROUND SPRING

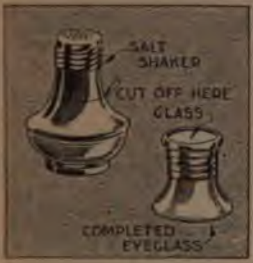
These Devices for Lubricating Automobile Springs can be Easily Installed and Give Good Service

Adjustable Roller Stand for Pipes, Bars, and Rods

In handling long pipes, bars, rods, and similar pieces, a stand, having a roller at the top, is a great convenience, both in the saving of time and of heavy labor. Several of these can be arranged in a row where workmen are shunting the pieces a considerable distance. The stand shown in the sketch is of cheap and simple construction, yet quite substantial. A section of pipe is mounted on iron plates and into the top of it is fitted a screw arrangement. This may be a vise screw and nut, as shown, or a large bolt. The roller is set in a bracket, which is bolted to the vertical adjusting screw.—R. B. Sands, Detroit, Michigan.



Aluminum Salt Shaker Made into Lens Holder



When the hard-rubber holder of an eyeglass lens, used considerably on fine shop work, was broken, it became necessary to replace it promptly. A novel method of replacing the parts was used, the upper end of an aluminum salt shaker being cut and shaped for the purpose. The end was cut as indicated, after the salt shaker had been mounted in a lathe chuck, and the upper end was spun out to fit the lens. The larger end was also spun out to give the proper curve to the holder. The blunt-nose spinning tools used were ground from steel rods and mounted in the tool post.—Ben Frantzreb, Indianapolis, Ind.

Proper Method of Folding Blueprints

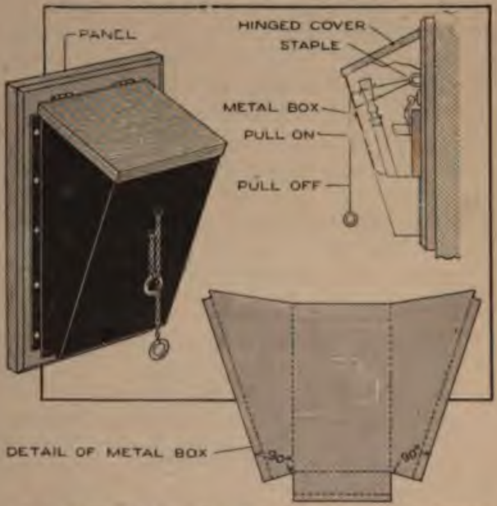
When folding large blueprints for mailing, filing, or other purposes, they should be folded with the blue, or printed, side out, and with the title, or description, in the lower right-hand corner of the folded print. This facilitates handling and filing, and saves the useless unfolding of the print, which wears it unnecessarily.

Old Saws Provide Good Stock for Tools

Various kinds of tools made of flat pieces of steel can be cut from old saw blades, ordinary handsaws being used for the thinner stock, and heavier circular saws for heavier material. The steel must be annealed to make it easily workable, and the tools may be hardened if desired. Some of the tools that can be made in this way are squares, calipers, gauges, and various types of measuring and marking tools, shaped from flat steel.

Metal Case with External Control for Knife Switch

It is dangerous to have an unprotected knife switch so placed that it may be unwarily touched by some one with the bare hand. A good plan is to inclose the switch in a homemade metal case, so that the electric arcs made on opening and closing the switch are properly guarded. A V-shaped box several inches longer than the switch should be constructed from sheet iron, as detailed in the layout. Screw the box to the switch panel, as shown, and make a suitable cover, hinged at the top. The box and cover can be painted black, or the cover painted red to locate the switch box easily. To make a control operated from the outside of the box, as detailed, bore two ¼-in. holes through the front of the box. A staple is driven into the panel near the switch handle. A small chain or cord is passed through the holes and thence through the staple, and to it is fastened the switch handle. Rings are attached to the ends of the chain, and by pulling the correct end the switch will open or close, as desired.—C. M. Hall, St. Louis, Mo.



The Switch is Properly Guarded, and can be Opened or Closed Handily by Means of the Chains

¶A small boat being towed may be steadied by dragging a bucket behind it.

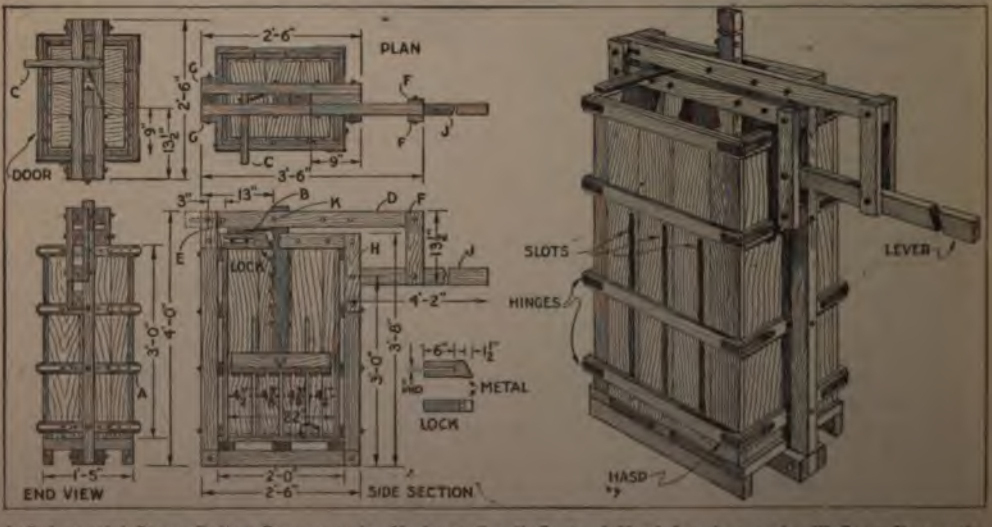
A Homemade Paper-Baling Press

By CLIFFORD A. BUTTERWORTH

HOME mechanics fairly handy with tools can make this baling press at a comparatively small cost, depending on whether or not old material is used. It will soon pay for itself through the sale of scrap paper that would not be accepted in loose form. To operate the press, push the lever D back to the position shown by the dotted lines, lift the ram as far as it will go, and put in the paper. Then lift the lever J about 2 ft., pull the lever D forward so the bolt K will slip into one of the notches, and pull down. Repeat until the paper is well compressed. To make a good bale, a piece of heavy cardboard should be placed on the top and at the bottom. Iron wire of No. 18 gauge is used for tying. When sufficient paper has been used to make a good-sized bale, take three 6-ft. lengths of wire and without removing the pressure insert them in the slots. Run the ends through spaces between the strips, at the top and bottom of the bale, and bring them together in front, fastening them tightly by twisting. Then release the ram and take out the bale. The press should be screwed to the floor with heavy angle irons.

First construct the box of matched ⅞-in. boards. Fasten them together with cleats long enough to project ⅞ in. on each side, and 1½-in. screws. Make the sides 15 in. by 36 in., and the back 21¾ in. by 36 in. In making the back, do not put a cleat at the lower edge. Before screwing on the cleat A, cut the three slots shown in the side section, making them ¾ in. wide. Fasten the sides to the back with angle irons, and then screw in the bottom, which is 15 in. by 20 in. long. Nail the eight 15-in. strips across it, spacing them about ½ in. apart.

Make the frame next, as detailed in the working drawings. In the plan above the end view, the lever arrangement is omitted, to show the frame construction clearly. The lock must also be put in place. Fasten a piece of sheet metal over the beveled end to keep the bolts from wearing the wood, as shown in the lock detail. Lining the slot with metal will make the lock slide easier. A heavy spring, B, is attached to pull the lock forward, so it will engage the notches as the ram goes down, and keep it from springing up. A lever, C, 14 in. long,



A Substantial Paper-Baling Press can be Made at Small Cost of Used Lumber, and will Soon Repay the Labor and Expense from the Sale of the Baled Paper Not Otherwise Salable is arranged to force back the lock when it is desired to release the ram.

The main lever D is built up as detailed. Cut a slot, E, in the two main upper pieces of lever D, making it ⅝ in. wide. The two 13½-in. pieces F connect the levers as shown. These, as well as the pieces G and H, should be of ash, or other hard wood. The piece H is 15 by 3 by 1 in., bolted at the upper end with an 8-in. bolt, which also holds the frame together.

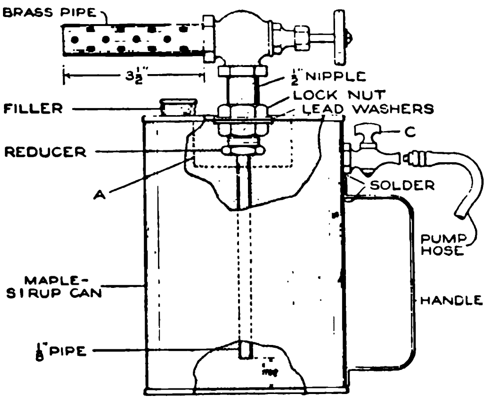
To make the ram, take a 2-ft. 6-in. piece, and beginning 9 in. from the end, bore seven ½-in. holes, 3 in. apart, from center to center, and insert 4-in. bolts. Then, just above each bolt and as close to it as possible, cut a notch, shaped as shown, 1½ in. wide and 1 in. deep. The other details can be easily observed from the working drawings and the perspective sketch.

Novel Illuminated Flag Made of Christmas-Tree Ornaments

The owner of a drug store wanted to display our national emblem in a novel way, and asked me to help him make up a flag, about 12 by 18 in. in size, of small electric lights, for his window. After figuring the cost, I made up a flag that answered the purpose of electric lights at night, and which has the advantage of being plainly visible in the daytime. It was made as follows: A picture frame was procured, and painted a dead black. A piece of black velvet was stretched and tacked over the back of it. An equal number of small red and silver glass balls, ¾ in. in diameter, used for Christmas-tree decorating, were obtained, and also some blue ones, ½ in. in diameter, for the blue field, and ½-in. silver balls for the stars. The stem of each ball was dipped in thick glue, and the balls set in position on the velvet, to make the stripes, the blue field, and the stars. When dry, the framed flag was hung in the show window, and an electric light, inclosed in a reflector, was directed upon it from in front. The colored balls each reflected the electric-light bulb in miniature, giving the appearance of the glowing filament in small electric lamps, and the flag proved very attractive.—G. H. Niederhoff, St. Louis, Mo.

Blowtorch Homemade from Strong Can

A blowtorch is easily made of an old maple-sirup can of heavy tinned sheet iron, as shown. A ½-in. brass nipple is soldered to the can, and an old globe valve fitted on. Into this is screwed a 3½-in. piece of thin brass pipe with holes bored in it, ⅜ in. apart and staggered. An old bicycle pump, with a ball check valve is provided. A small brass cock supplements the ball check valve, which is opened to force air into the tank. On one side of the can, solder a handle. Remove the cork insert in the filler cap, and in its place put an asbestos washer. Fill the can half full of gasoline and pump in air.

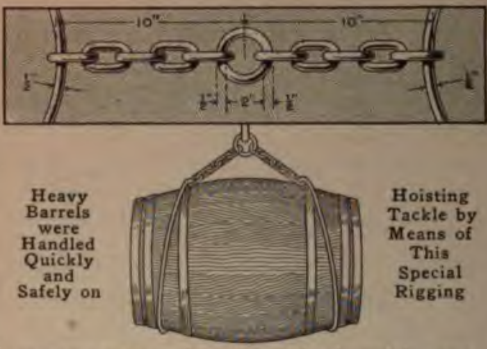


This Homemade Blowtorch Is Inexpensive and Has a Wide Range of Use for the Mechanic and in the Home Workshop

To start the torch in operation, after the proper pressure is obtained, fill a baking-powder can cover half full of gasoline, set it under the torch pipe, and light the gasoline, which heats the valve and nipple. When it is hot, open the valve slightly by the handwheel, and by igniting the spray, a hot flame is produced, which is intensified by the increase of the air pressure.—P. P. Avery, Garfield, N. J.

Tackle for Hoisting Heavy Barrels

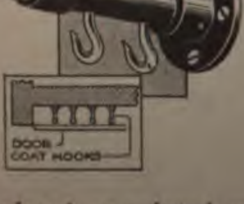
Instead of using grabhooks or improvised rope slings for handling heavy barrels on a derrick or with other hoisting apparatus, the shop blacksmith was ordered to make a set of rings with suitable chains to fit the barrels so that they could be hoisted quickly and safely. The rings were made of ½-in. round steel rods, welded. They should be of a size to fit the barrels snugly and to cramp in the positions shown in the illustration.—C. C. Spreen, Flint, Michigan.



Heavy Barrels were Handled Quickly and Safely on Hoisting Tackle by Means of This Special Rigging

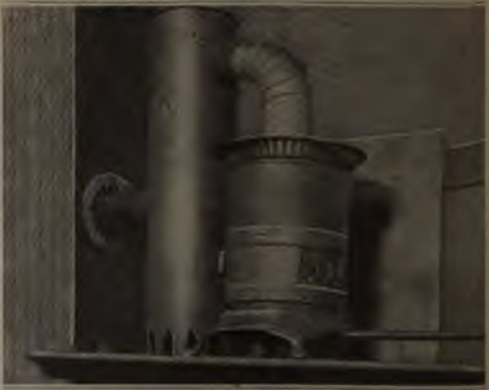
Combination Doorstop and Coat Hook

A homemade device which is used as a combined doorstop and coat hook, singly or in series, is practical where space is limited and the walls behind doors are available for the hanging up of clothes in shops or similar places. It consists of a ½-in. pipe nipple, about 4 in. long, one end screwed into a coupling, in which a rubber stopper is pressed, acting as a buffer, so as not to injure the wall. The other end is screwed into a flange which is fastened to the wall. The hooks are riveted in the pipe. The device is inexpensive, and if bronzed, nickel-plated, or painted, makes a neat fitting. —Ernest Schwartz, Brooklyn, N. Y.



Hot-Air Heater Protects Water Pipes from Cold

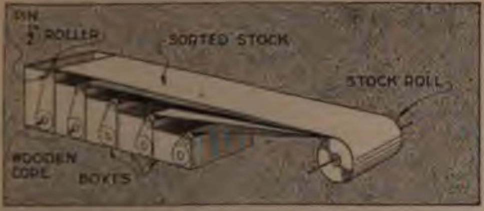
In many buildings that have more or less exposed water pipes, considerable trouble is met with in thawing out pipes during a cold wave. This is a tedious, tiresome job, especially where the pipes are hard to get at. This was the case in an oblong three-story building with a large light court running up the center. The water pipes run up along the wall of the light court and are inclosed in a box. The owner avoided frequently frozen pipes by rigging up a stove to heat the pipes in winter, the box carrying the pipes acting as a chimney for heat. There was a natural-gas jet close to the pipe box. A shelf was put on the wall, and an old stove was connected up as shown. The top was made solid so that most of the heat is carried up into a larger pipe with closed top. To avoid danger of fire, the larger pipe has V-shaped openings cut around the bottom edge to take in air, and the pipe conducting the heat into the box has a large galvanized-iron ventilating collar so as not to scorch the wood. A gas flame, ½ in. high, does the work and uses about 1,000 ft. a month.—Arthur L. Burgess, Columbus, Ohio.


This Heating Arrangement Overcame Troublesome Freezing of Water Pipes in Cold Weather, and was Cheaply Installed

¶Shellac is suitable for varnishing carburetor floats used with gasoline, but is not satisfactory if alcohol is used.

Winding a Roll of Several Layers at Once

To wind a stock roll of several layers of paper, tin foil, etc., in one operation, first have as many small boxes as strips to roll, each one a little lower than the one back of it, arranging them in a row as shown. Cut pieces of ½-in. dowel rod a little shorter than the width of the boxes, and make a roller of each dowel piece. Have the roller just above the front of the box. The rollers are necessary to protect the paper. Have the strips wound, placing them in their proper order in the successive boxes. Bringing out their ends, roll or fold them together as desired. Strips 100 ft. long can be nicely handled in this manner. This method can be used for many purposes, where long strips of different materials are to be rolled together, and kept free from air currents and dirt.—L. M. Drake, Daytona, Fla.



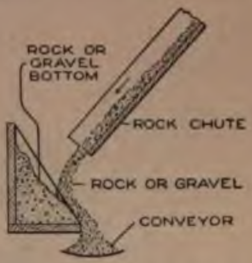
A Stock Roll of Several Layers can be Made Easily with an Arrangement of Bobbins

Small Magnet Useful in Woodshop

An ordinary magnet is a great help in picking out small tools, nails, and other iron objects, from shavings and sawdust. By running it through the shavings collected on top of a workbench, it will collect every small iron article and save many a loss. It can also be employed in locating the position of covered nails before sawing through old work. The magnet should be hung up with a "keeper" across its ends when not in use. An electromagnet, used similarly, will prove still more useful than a common magnet for the purposes mentioned.—Henry Simon, Laguna Beach, Calif.

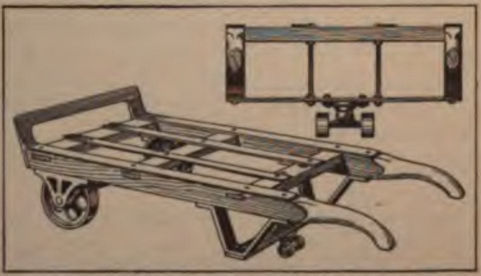
Deflector for Bottom of Rock or Gravel Chute

The sketch shows a method of building a crushed rock or gravel drop, or catch, box to be placed at the lower end of an inclined chute. The continued action of rock or gravel falling from a chute on a bare wooden deflector, or even a deflector lined with sheet iron, soon wears it out, and it must be replaced. By the method shown, the gravel forms its own wearing surface, and the wooden box does not require frequent renewal. This method can be applied to a large variety of work where building materials, coal, etc., are handled in wooden troughs, or in various gravity conveyors.—Roy H. Poston, Flat River, Mo.



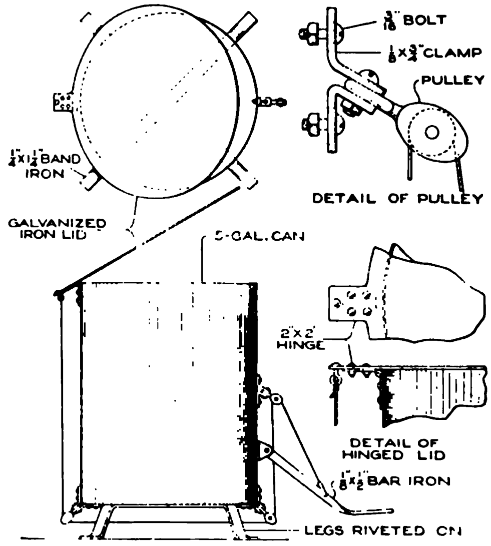
Pivoted Rear Caster Improves Barrow Truck

Many hand trucks for carrying heavy loads have only two casters or wheels, and when a considerable weight is being moved the workman finds it hard to handle the outfit. In a large shop it was found that the work was made much easier by fitting the trucks with an extra double-roller caster pivoted under the rear support of the truck, as shown in the sketch. This enables the workman to rest the load and shift it along the floor on its bearings.



The Pivoted Rear Caster Makes It Possible to Handle Heavy Loads without Lifting Them Clear in Transit

Sanitary Shop-Refuse Can with Pedal-Control Lid



Sanitation was Promoted in a Large Shop by Providing a Strong Pedal-Control Covered Receptacle for Refuse

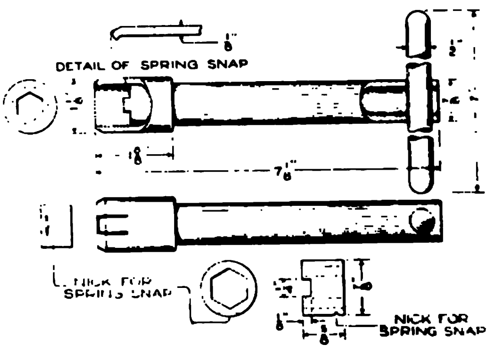
To promote sanitation, and the keeping down of possible contagion from flies and other pests, a strong and practical refuse can was designed as the standard for a large plant, and the various shops were fitted out with these receptacles. Five-gallon cans were used for the containers, and the lids, of heavy galvanized iron, were fitted to them by means of a hinge, as shown in detail. The legs, of band iron, were arranged to support the bottom, and the cover was controlled by a pedal, rigged with a heavy cord and suitable pulley. A detail of the upper pulley is shown in the sketch. The interior of the can was suitably painted, with a black asphaltum paint, and the exterior painted with a lead paint.—A. P. Midland, New York, N. Y.

Concrete Liners Overcome Wear at Turns in Flumes or Troughs

In wooden flumes used for transporting material in water, such as cinders, gravel, and other materials that have a tendency to cut out the sides of the flume, especially at bends, repairs or renewals are often needed, causing a great deal of annoyance and expense. Concrete liners, fitted into the flumes, or troughs, at the points of wear, greatly increase the durability of the flumes, especially at the bends. Nails are driven in the side of the flume before the concrete is set to hold the liner in position.—H. P. Roy, Omaha, Neb.

An Adaptable Socket Wrench

A design for a strong, light-weight, adaptable socket wrench, especially useful for the motorist's tool kit, is shown in the sketch. It is for use on nuts up to ⅝ in. across flats, and its best feature is that new inserts can be quickly and cheaply made for it to fit various sizes or shapes of nuts within its range. These interchangeable inserts are driven by a key in the end of the shank, at the bottom of the socket. The insert is retained in the socket by a spring snap which engages a nick on one side of the insert, as detailed. The inserts are made of tool steel, hardened. Machine steel, casehardened, can also be used. The shank is made of steel tubing. The sleeve is also a piece of steel tubing, and is brazed or pinned in place. The spring snap is made by cutting two saw kerfs, about ⅜ in. apart, as shown, and upsetting the end of the metal between them so as to engage the nick in the socket.—W. B. Burr, Bridgeport, Conn.

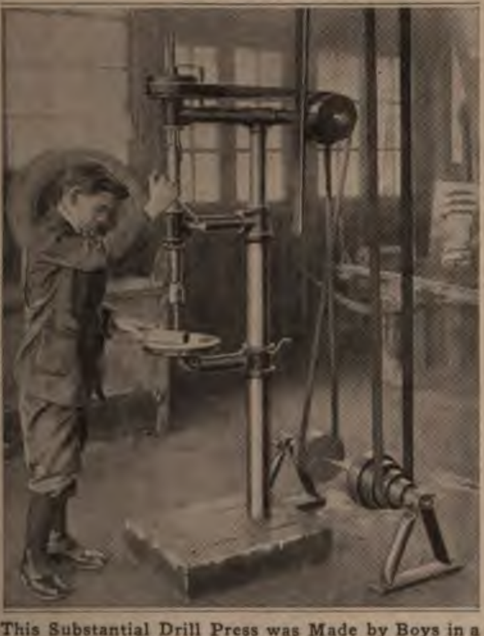


An Adaptable Socket Wrench with a Set of Inserts to Fit Various Nuts Is a Handy Tool for the Motorist or General Mechanic

Substantial Power Drill Press Made of Pipes and Fittings

By RAY F. KUNS

PRACTICAL mechanics who build small machines for use in their workshops, often make use of pipes and fittings and usually get fair results. By carefully working out a design for a drill press, which is suitable for construction with these standard parts, and giving special attention to the machining and joining of the various members, the drill press shown in the photograph and detailed in the working drawings, was made. It gives very satisfactory service, and compares favorably with standard machines of its size, though the cost was comparatively slight. It has stood up well under very hard service in a school machine shop. The design can easily be adapted to a smaller-size machine, or revised for special classes of work. It will carry a drill up to 1 in. in diameter. It has four changes of speed, ranging from 84 to 666 revolutions per minute.

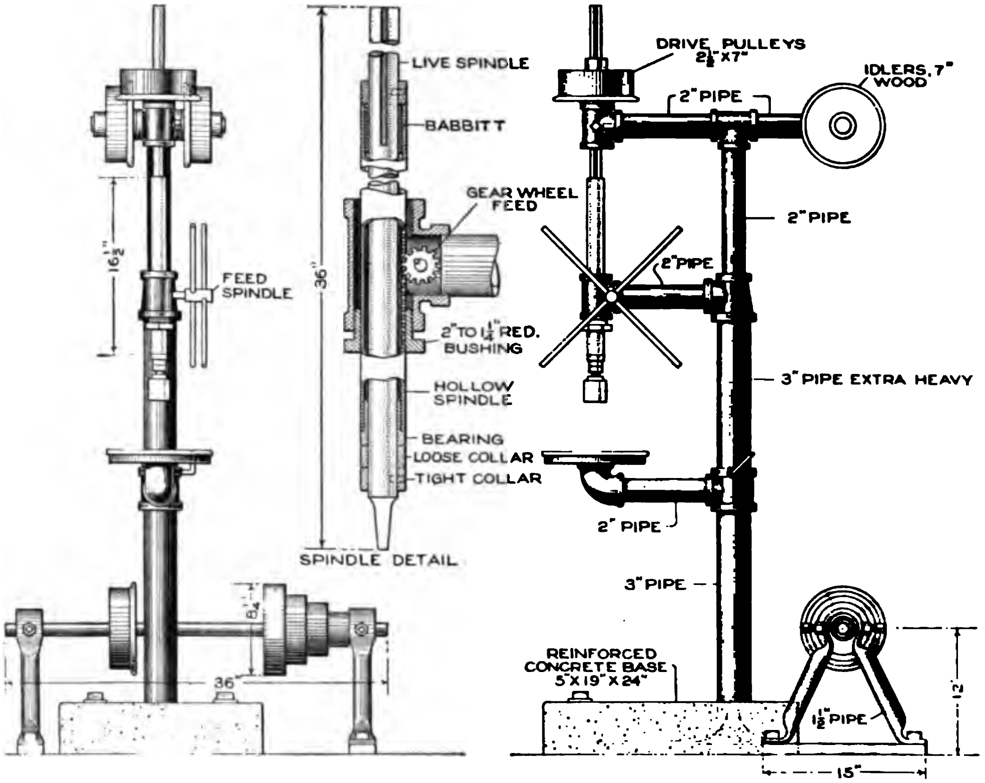


This Substantial Drill Press was Made by Boys in a School Shop, Pipes and Fittings Being the Chief Materials Used. It has Withstood Hard Wear

The main support is a 3-in. extra-heavy pipe. The height from the floor to the center of the spindle arm is 4 ft. 4 in.; from the floor to the center of the upper arm is 5 ft. 10 in.; from the center of the main support to the center of the spindle is 15 in. The arm which carries the table is adjustable on the pipe support, the latter being turned to a good finish. The tee, which slides on the post, is bored out to fit the latter, and is clamped by means of a threaded handle. The bottom of the main post is split, spread, and bolted to an iron plate. This is imbedded in the concrete base, as shown in the side view.

The tee under the drive pulley at the upper end of the spindle shaft has a bearing made from a piece of 1¼-in. gas pipe. This is first babbitted, then scraped, and the holes for the setscrews drilled and threaded. The same type of bearing is used in the hangers, four of which are required, two for the upper and two for the lower countershafts. The hangers are forged, as shown in the drawings, from 1½-in. gas pipe.

The gear wheel in the spindle feed is ¾ in. thick and 1¼ in. diameter. The teeth, 12 in number, are made from ¼-in. cold-rolled steel, set into tapped holes. The hollow spindle, which is made from 1½-in. gas pipe, has a row of 9/32-in. holes drilled in the side, to form a rack for the gear to work in.

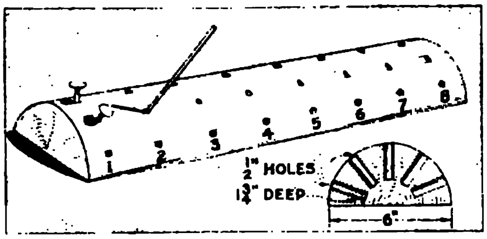


While the Cost of This Drill Press Is Comparatively Slight by Reason of the Use of Pipes and Fittings, the Service It Gives Compares Favorably with Standard Machines of This Type and Size

The chuck should be procured before working up the live spindle, that these parts may be fitted properly.

Disassembling Rack Keeps Engine Parts in Order

When taking apart an engine, especially one of several cylinders, there is considerable risk of getting the parts mixed, making successful operation of the assembled machine almost impossible. A simple method of caring for the parts is to place them on a disassembling rack made of a heavy piece of wood, cut to the shape shown and provided with numerous holes in which pins are inserted for small parts having center openings, and providing also for various kinds of rods. Each cylinder has a separate row on the rack, numbered as indicated.—J. J. Green, Chicago, Ill.



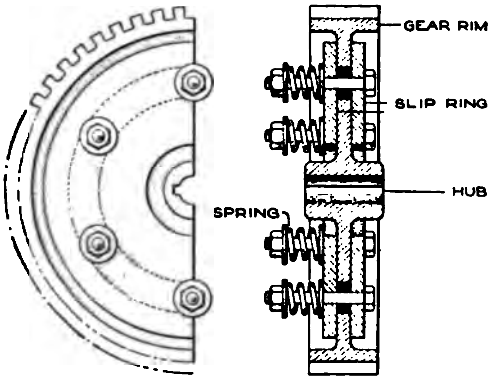
The Engine Parts are Placed Systematically on the Rack When Disassembling, Thus Insuring against Mixing Up the Parts Easily

Simple Method of Soldering Granite Ware

Many persons have the impression that it is almost impossible to repair a leak in a piece of granite ware, but if the following method is tried, the amateur will have perfect success. With a sharp file cut away the porcelain, and buff the exposed metal until it is shiny. Apply soldering acid, and with a hot iron apply half-and-half solder, the same as one does in soldering tin. The solder will repair the leak permanently, for we have pieces of granite ware mended in this way in our kitchen, and they have been in use several months since repairing.—John F. Robinson, North Adams, Mich.

Slip Gear Minimizes Breakage of Teeth

On many kinds of machinery where inexpensive cast gears are used, as well as in some other cases, a type of gear has been found useful for preventing undue breakage of the teeth. Heavy strain is caused on the gear teeth by sudden stopping, starting, or reversing, and a gear in which the hub is separate from the rim, the two sections being held together by slip rings as shown in the illustration, gives the proper relief to the gear teeth. The slip rings are bolted securely with tension springs. When the strain becomes too great, the outer ring revolves, and the hub remains stationary until normal conditions obtain.—C. Van Den Berg, Jr., Gadsden, Ala.



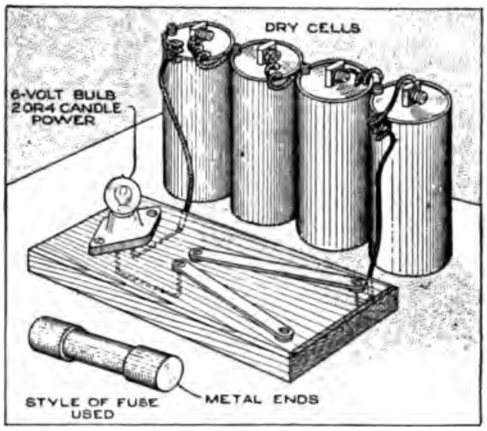
When the Strain on the Gear Teeth Becomes so Great that Breakage may Result, Damage is Prevented by the Slipping of the Rings

---

¶A coating of paraffin oil should be applied to the surface of freshly cleaned iron to protect it from oxidation before the paint is applied.

Test Box for Electrical Fuse Cartridges

For testing electrical fuses of the cartridge type, to determine whether or not they were serviceable, a small outfit was rigged up as shown. Brass strips were mounted on a board with screws so that fuses of various lengths could be tested by setting them across the strips with the metal ends of the fuse in contact with the brass. If the fuse is good, the small electric bulb is lighted when in circuit with the dry cells.—A. E. Rounds, Milwaukee, Wis.



The Fuses are Placed in Circuit by Setting Them across the Brass Strips, and the Bulb Lights as the Current Passes through a Serviceable Fuse

Portable Tool Rack for Mill Room Aids in Checking Up Tools

It was customary in a certain plant to "clean up" the mill room every Saturday afternoon. Upon the arrival of the mill hands on Monday morning it was discovered that various tools, such as squares, rules, straightedges, etc., were missing, and it was only after lengthy search that the tools were found in obscure corners or drawers. To overcome this, an A-shaped tool rack was constructed, 5 ft. long and 2½ ft. high, and provided with casters. On "clean-up" day various tools are placed on hooks on the rack, which is pushed around the shop, and finally taken to the tool room.—Joseph Plogmann, Cincinnati, Ohio.

A Long Island Scooter Driven by a Motor Aero-Propeller

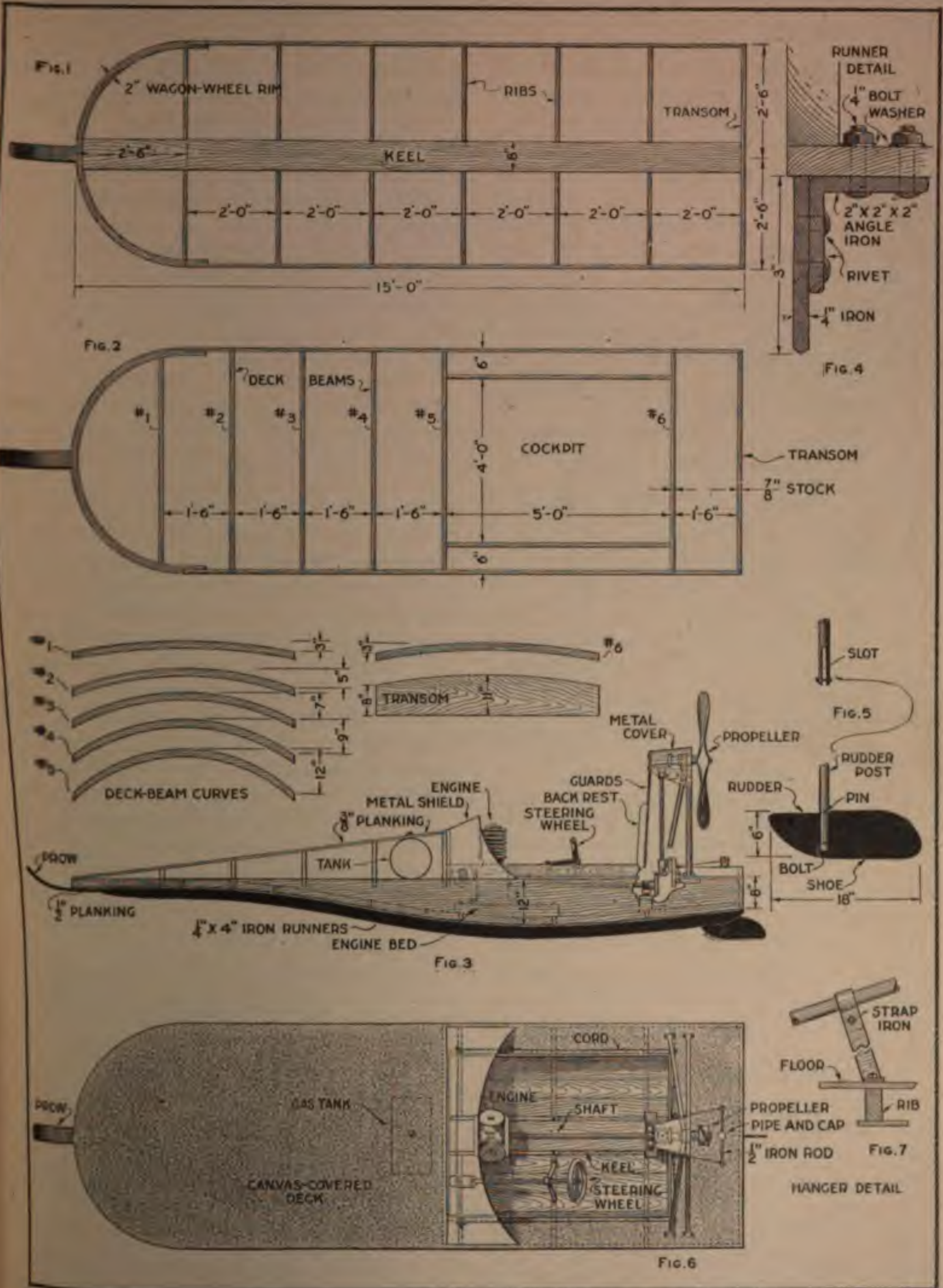
By L. B. ROBBINS

A craft that affords much sport for the ice speed enthusiast is the "Long Island Scooter," which gets its name from the fact that it has long been popular on the waters of Long Island Sound. It is something of an amphibious boat-sled, and can sail on the ice, on ice-covered land, or on broken ice with stretches of open water. The original scooter is a sailing craft, rigged in various ways, like an ice sailboat. With the power from a gasoline motor of about 4 hp. applied to an aero-propeller of 3-ft. sweep, the scooter has a much wider range, and is practically independent of wind and weather during its season. It is controlled from the driver's seat at the steering wheel, like an automobile or speed motorboat, as shown in Figs. 3 and 6. The installation for the motor and control mechanism is arranged convenient to the steering post, within easy reach. The engine is set well forward in the cockpit, and the steering wheel on the port side, leaving room for a passenger, or cargo, on the starboard side.

The strong iron runners make the scooter ride easily, and also stiffen the hull. The iron prow aids in climbing over rough areas, and prevents the bow from crawling under ice ledges, when leaving open water. The engine may be of various types, and that indicated is a double-cylinder motor of about 4 hp., air-cooled, developing 500 to 700 r. p. m. on the main drive shaft, and 1,500 to 1,800 r. p. m. on the propeller shaft. The driving mechanism is suggestive only, since many mechanics prefer to devise these features to suit the materials and facilities at hand. This installation may also be left to a professional gasoline-motor mechanic, only the hull and minor fittings being homemade.

Begin the construction by making the framework, shown in Fig. 1. The sides are of ⅞-in. pine, cut 12 in. wide at the middle, 8 in. at the stern, as shown in Fig. 3, and 2 in. at the junction with the wagon-wheel rim, at the bow. The use of a wagon-wheel rim, of oak, which can be obtained of a wheelwright, makes it unnecessary to do the tedious work of steaming and bending this heavy material. The rim is bolted to the sides. The ribs are of hard pine, ⅞ by 2 in. in section. The stern transom, as detailed, is fastened into place with galvanized-iron screws, which are to be used throughout, instead of plain iron screws, as they withstand the water better. The keel, of pine, 1 by 8 in. in section, is laid on the ribs and fastened with screws.

Place the frame, bottom side up, on sawhorses, and plank the bottom with ½-in. pine, or cypress, boards. Set the nail heads and clinch the nails well on the inside. Plane the bottom off smooth and apply a coat of priming paint to the hull. Next cut the deck beams, as detailed, for the various stations. These beams may be steam-bent or cut, 2 in. wide, from a good quality of ⅞-in. stock. Nail the beams into place, as indicated in Fig. 2. Beams Nos. 5 and 6 are set 5 ft. apart, to make a frame for the cockpit, with the beams at the side coaming set 6 in. from the sides. Plank the deck with ⅜-in. cypress, or pine, and cover it with canvas, if desired. Boards for the floor, of ½-in. stock, may be fitted into place, but should not be nailed down until the



The Scooter Is an Interesting Mechanical Construction for the Winter Speed Enthusiast. The Craft may be Made and Installed Complete by the Builder, or He may Make Only the Hull and Its Fittings Other Than the Power Plant and Driving Mechanism. Fig. 1 Shows the Hull-Framing Plan; Fig. 2, the Deck-Framing Plan; Fig. 3, a Side Sectional Elevation; Fig. 6, an Assembly Plan and the Other Figures, Details of Construction other interior fittings have been placed finally. Fit the supports under the after deck, for fastening the machinery fittings, and set blocks for strengthening the hull at the rudder post, as detailed in Fig. 8. Fasten the coaming around the cockpit, and build a suitable base for the engine. The metal shield, in front of the engine, can be fitted handily before the machinery is installed, and laid aside until finally needed.

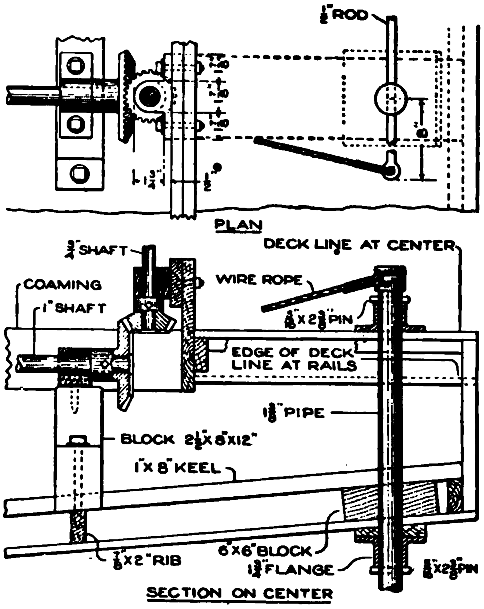


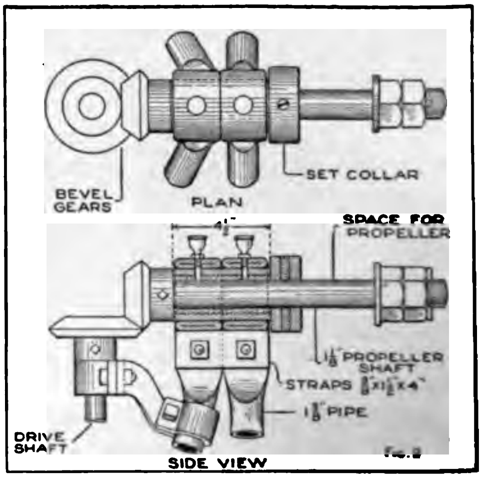
Fig. 8

Details of Construction at the Stern: The Section on the Center Shows the Fitting of the Gears and Connections of the Main Drive Shaft and the Vertical Shaft, and the Fitting of the Rudder Post. The Plan Shows a View from Above

The metal fittings of the hull, apart from the power-plant installation, may be considered next. The runners are shaped, as indicated in Fig. 3 and in the detail drawing, Fig. 4, from ¼ by 3-in. sheet iron. The stern end is tapered off, and the bow end is tapered and curved in, to match the curve of the rim. The runners are fastened by means of angle irons, as detailed, and bolted through the floor, or the floor and iron straps, hung over the top edges of the ribs, adjoining the inner sides of the hull. A metal prow, 5/16 by 4½ in. in section and hammered to a slight dished effect crosswise, extends 15 in. beyond the bow rim, and is bolted to the bottom and keel. The rudder is of sheet iron, as detailed in Fig. 5. The lower edges of the runners and the rudder are sharpened slightly to give a good grip for steering the craft on the ice.

The installation of the steering mechanism is shown in plan in Fig. 6, in a side elevation in Fig. 3, and in detail, as to the steering-post fitting, in Fig. 8. The crossbar of the rudder is fastened to a pliable steel cable, 3/16 in. in diameter, and this is reeved through suitable pulleys to carry it around the cockpit coaming, as shown in Fig. 6. The cable passes through the coaming at each side near the front end of the cockpit, and is wound about five turns around the 3-in. wooden drum, fixed to the steering post. The steering post is of pipe, 1¼ in. in exterior diameter. Its lower end is set into a metal flange, its upper end is shouldered with a threaded collar, and the steering wheel screwed on and suitably capped. The steering post is braced by a hanger of ¼ by 1¼-in. strap iron, as detailed in Fig. 7.

The details of the rudder post are shown in Fig. 8, which also shows the details of the gearing shafts and bearings at the junction of the [illegible] drive shaft and the vertical co



Details of Construction at the Propeller Shaft: The Supporting Standards are Forged around the Propeller-Shaft Bearing, and the Vertical Shaft is Held Rigid, at Its Bearing, by a Strap-Iron Bracket

The rudder post is a pipe of 1⅜-in. exterior diameter. It is carried at its ends in pipe flanges bored out to a snug fit. Two round steel pins hold the post in position. A pipe cap at the upper end carries the rudder crossarm, as detailed in the plan. The main drive shaft is carried in a solid bearing, suitably babbitted, or provided with a bronze bushing. The bearing is bolted to a heavy block, as shown. The bevel gears are of machine steel, and are in a ratio of two to one, the smaller gear being of 3-in. pitch diameter. The vertical ¾-in. shaft is carried in a similar smaller bearing, bolted to the reinforced coaming.

The general arrangement of the propeller shaft and its connections and supports is shown in Figs. 3 and 6, and in detail in Fig. 9. A bevel gear of 4½-in. pitch diameter transmits the power from the ¾-in. vertical shaft to the 3-in. bevel gear on the 1⅛-in. propeller shaft. The latter is carried in a bearing made from a seamless steel tube, provided with a suitable bronze bushing and oil cups. A set collar and jam nuts, as well as a keying, or other standard device employed on aero-propellers, hold the propeller in place. The bearing is held solidly in a housing forged into the standards of 1⅜-in. pipe, which support the propeller shaft and connections from the stern deck. The forged pipes are fitted snugly around the bearing, and clamped to it by means of two straps of iron, and bolts, as shown. The vertical shaft is carried in a bearing similar to that used at its connection with the main drive shaft, as indicated in Fig. 8. The bearing is supported rigidly by a brace of 5/16 by 1½-in. strap iron, bolted to the forward pipe standards. The lower ends of these standards are split and forged to provide a flange for secure bolting at the reinforced points of fastening on the deck.

The gearing, etc., of the propeller shaft is covered by a sheet-metal hood, as shown in Figs. 3 and 6, as a safety measure, and also as a protection for the machinery. The hood is braced in front by two iron guard rods, as shown in Fig. 3, which support the back rest for the driver and passenger. This rest is also essential in guarding the occupants from the machinery, and the main drive shaft should also be guarded. The driving mechanism, and especially the gearing connections and sizes, are suggestive only. They must be worked out according to the requirements of the power plant used. The propeller may be made or purchased complete.

Devices for Gripping Stock Accurately in a Vise

When gripping work which is rough in a vise, a frequent source of trouble is that the vise grips on one corner only. In milling or planing, the work is likely to be torn from the vise. To overcome this, the vise can be equipped with a simple jaw which equalizes the grip on the work. A jaw adapted to gripping rough stock is shown in Fig. 1. A is the fixed jaw and B the movable jaw. Attached to the movable jaw is the piece C, held in position by two screws D. This movable piece butts against the movable jaw, at E, and as the jaw is tightened by the screw F, the movable piece pivots at E, adapting itself to the work.

Another method of gripping the work is shown in Fig. 2. The purpose of the pin is to insure against the jaws pinching on the lower edge of the work G, causing chattering. These methods are good when gripping finished work that is not parallel.—H. M. Frank, New York, N. Y.

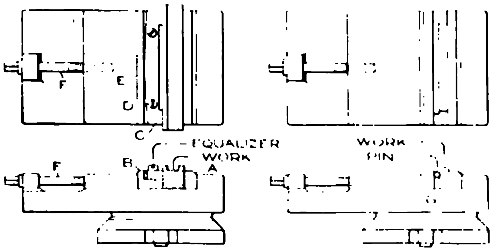
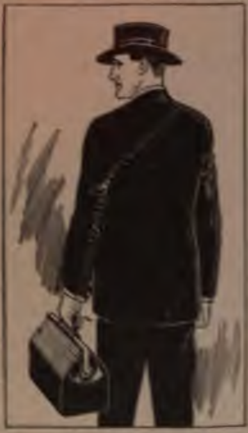


FIG. 1 FIG. 2

These Simple Methods of Gripping Work in Vises Are of Wide Use

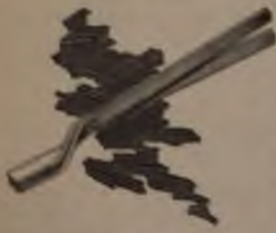
Novel Method of Strapping Money Satchel to Messenger

A paymaster, who carries a small satchel for his money and accounts, has devised a novel method of strapping the satchel around his shoulders, as shown in the sketch. A strong strap is fastened to the handle of the satchel and passes up his sleeve, around the right shoulder, and back to the sleeve across the chest. This gives him the free use of both arms in his work, as well as in defense against attack in an emergency.



Blacksmith's Tongs Made of Iron Strips Bent Cold

When a pair of heavy tongs are needed for an occasional job of forging, and blacksmith tongs of the usual pattern are not at hand, a substitute can be made quickly of two iron strips bent to the form shown in the sketch. No forging is necessary, as the metal can be drilled for a bolt and then bent cold making proper allowance in the size of work to be handled.—J. A. Ryan, Buffalo, N. Y.

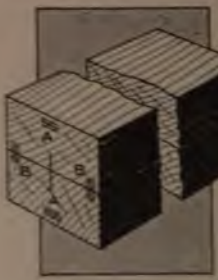


Polishing Overhead Shafting

In a large factory the brightly polished overhead shafting was quite noticeable. The method used to keep the shafting clean and free from rust was this: A pad covered with emery cloth and fastened to a long pole was held against the revolving shafting. The workman, reaching up with the pole, pressed the emery surface against the shafting, as desired, a fine polish resulting.—F. M. Ball, Kansas City, Missouri.

Centering Halved Pattern Work in a Lathe

The centering of pieces for halved, or split, patterns in the lathe is often done inaccurately, so that the halves are not equal, and have to be thrown away. A good method is to plane one surface parallel with the parting surfaces, and square up the ends from it. Fasten the pieces together, and, with dividers, scribe lines on both ends, as at A and B. When putting the work in the lathe, center as usual, but do not drive the centers home. Turn down to the outer series of lines, and stop the lathe. The slightest error will be easily detected, as some of the lines will be nearer the cut than others. Tap the wood to center it properly, and set the dead center in slightly. Turn down a small portion, and examine the work, setting it so that it is accurately centered.—D. D. Gurnee, Hempstead, N. Y.



Collar Setscrews Made from Ordinary Setscrews and Nuts

Fifty collar screws were needed in the shop, and not being able to obtain them locally, we made them as follows: A setscrew of the required size was taken, and a nut screwed very tight up to the head, with a wrench. The screw was then put in a spring collet in a lathe. The corners were broken with a tool, and then smoothed off with a file. This makeshift served the purpose exactly as well as the real article, and could not be noticed by a casual observer. The saving in time was considerable.—S. B. Royal, Baltimore, Md.

The Selection of Illuminating Units for Home or Office

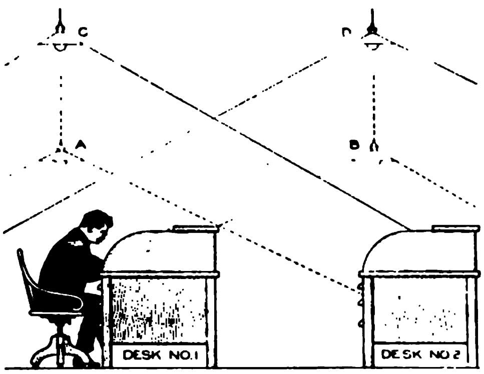
By K. M. COGGESHALL

The first rule to be remembered in planning artificial lighting is to avoid the use of a very bright spot in a poorly illuminated room. Such a condition prevents concentration, as the eye involuntarily fixes itself on the bright light. There should be a general illumination with additional lamps for local use, if necessary. It is best that only reflected light reach the eye; the source of illumination should be so placed that the direct rays are thrown on the work, and not in the eye. Precautions should also be taken to hang the light unit above the working plane in such a position that distracting shadows are not cast by the furniture or office fixtures, as indicated in one of the sketches, at A and B, as compared with C and D. The higher lights provide better light for both desks, No. 1 and 2, without shadows.

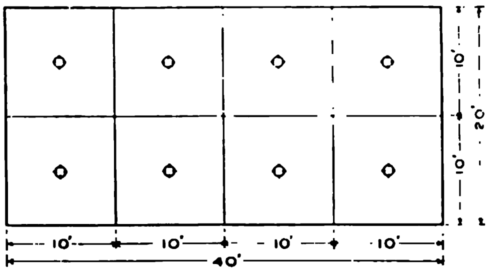
The illumination of a home is perhaps of first importance. If the rating used by manufacturers in classifying standard tungsten lamps is employed, the reception room, library, or living room should have an intensity of .9 watt per square foot of floor space. For instance, if the library is 12 by 16 ft. the floor area is 192 sq. ft. At .9 watt per square foot, about 173 watts are necessary for proper illumination. This value is approximated by using three 60-watt tungsten lamps.

The dining room should have a general illumination of about .4 watt, while the den should have at least .85 to .95 watt per square foot. It is necessary that the latter room be well lighted, as it is generally used for reading, writing, or playing games. Hallways, pantries, and closets should have an illumination of .2 watt. For the sake of sanitation, the illumination of the kitchen should be at least 1.3 watts per square foot. The lamps should be grouped under a cheap, yet efficient, 12-in. white-porcelain reflector near the ceiling. For the bedrooms .3 watt per square foot is satisfactory.

For the average office, an illumination of 1.3 watts per square foot of floor space is sufficient, except in instances where a great deal of stenographic or copy work is done, when the factor is 1.45 to 1.7 watts. For drafting work the range is 2.45 to 2.75 watts. The subject of spacing of the units is important. It presents a problem which cannot be entirely solved by mathematics; the answer is influenced by individual judgment and the cost of installation. The room should be laid out in sections of equal area, as shown in the other sketch. After the total watts per room have been determined, each section should be allotted its share. Standard lamps should then be installed in the center of each section. For the office, these lamps should be hung 12 to 14 ft. from the floor, while in drafting rooms, mountings as high as 16 ft. are sometimes desirable. Where



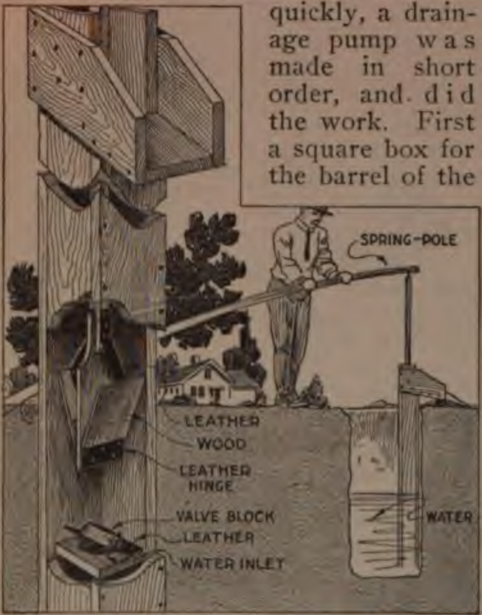
The Higher Lights Provide Better Light for Both Desks, and without Troublesome Shadows



The Room is Laid Out in Squares and Each Section Allotted Units for Proper Illumination the ceiling is low, limiting the available mounting height, it is desirable to use smaller spacing, and more lamps of smaller candlepower each.

Drainage Pump Improvised on the Job

On an excavation job where water was struck, and had to be removed quickly, a drainage pump was made in short order, and did the work. First a square box for the barrel of the pump was made, and a valve block with a leather-and-wood valve cap, as shown, was fitted into the pump near the lower end. A spout was fixed near the upper end. The plunger was made of a square pole, at the lower end of which a water lift was rigged, as indicated. Two sections of wood were hinged to the central piece and braced by straps. When the pump plunger is lifting a load, the wooden hinge pieces are weighted down and form a close contact against the sides of the pump barrel. When the plunger is lowered into the water these pieces fold back against the center piece. The parts must be fitted closely to give good results. A spring pole was attached to the upper end of the plunger, and fastened at one end by means of logs.



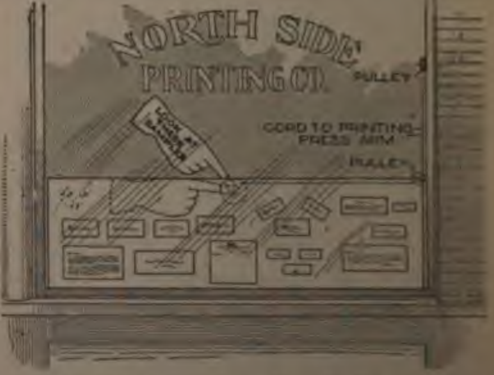
This Crude Form of Plunger Pump was Rigged Up on the Job When Water was to be Removed from an Excavation Quickly

Pencil Held to Teeth Detects Knocks in Inclosed Machine

When part of an inclosed machine, for example a blade in a centrifugal pump, is pounding slightly, the affected locality needing adjustment can often be found without removing the casing. The operator touches the casing with a hard pencil point, the butt of the pencil being against his front teeth. The vibrations due to the pounding will attract his attention to the place to be adjusted without removing the casing to locate it.—R. Z. Kirkpatrick, Washington, D. C.

Moving Hand Draws Attention to Window Display

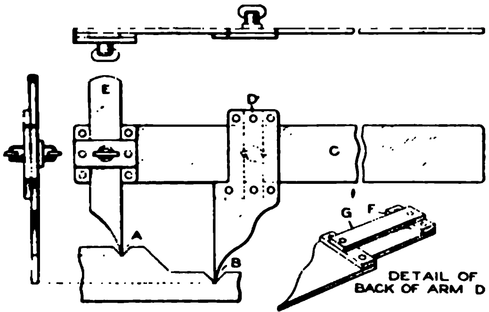
Moving objects in window displays are good means of advertising, as they command attention. A printer having a sample case built directly underneath his show window, had a large hand painted on tin, on which was inscribed "Look at These Samples." He then fastened a wheel to the pointing finger, and connected it to the arm of a printing press near by, by means of a series of grooved pulleys and a string. It was adjusted so that at each revolution the hand would be raised pointing to the samples in the case. As the press reaches dead center, the hand remains stationary for a moment, and then disappears from view.—M. J. F. Schramm, Brooklyn, N. Y.



The Hand is Connected to a Near-By Printing Press by a Cord and Pulleys, so That It is Raised and Lowered by the Revolution of the Press Shaft

Special Sliding Caliper Useful on Many Jobs

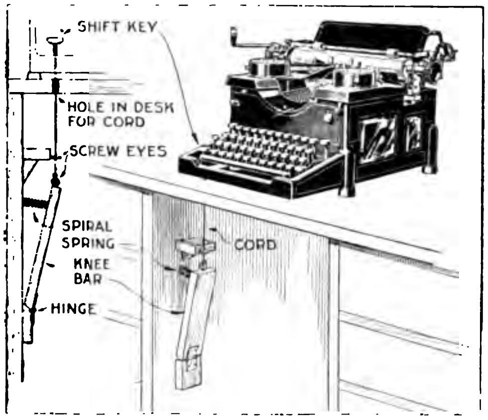
The usefulness of a sliding caliper can be extended by making the legs pointed and providing the end leg with a vertical adjustment, as shown. A typical example is in scaling the distance between two points not in the same plane, as the points A and B. The body C of the caliper is made of machine steel. The legs D and E are made of the same material and shaped as indicated. The slides on the legs are made by riveting two strips of sheet metal, F, and a third, G, to the leg, as detailed. A thumbscrew through G clamps the leg. The leg E is constructed as shown, a small strip being riveted on the front. The legs may also be machined from solid pieces, the slots being drilled and filed. The leg D may also be made with a vertical as well as a lateral adjustment.—William A. Robinson, Waynesboro, Pa.



This Homemade Tool Has a Wide Range of Usefulness on Work Not Practicable with an Ordinary Caliper

Knee Lever Actuates Shift Key on Typewriter

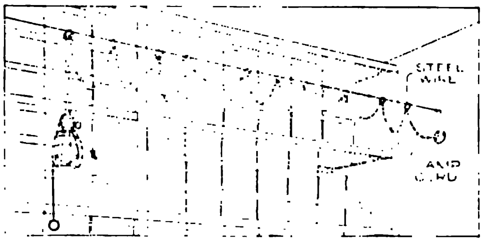
An unskilled typist, of the "two-finger" school, found that time was lost in striking the shift key, as this operation took one of the two fingers. In order to save this lost motion, he bored a small hole through his desk directly below the machine, and ran a cord through it, the upper end of which was hooked over the shift key of the typewriter, as indicated. A knee pedal was arranged as shown. The upper end of the pedal was connected with the string, which passed through an eye, to give a straight pull on the key. To strike a capital, the knee is pressed against the pedal, giving the operator greater speed. This arrangement is practical even for a skilled typist.—John D. Gilbert, Eugene, Ore.



Greater Speed can be Attained on the Typewriter if One or More of the Shift Keys are Controlled by Pedals

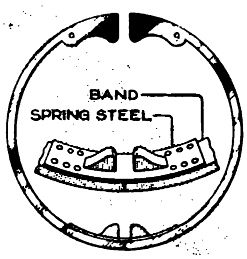
Lamps for Stock Room Shifted along Horizontal Wires

Below long rows of shelves or racks in stock rooms, it is sometimes necessary to install an electric-lighting system. The method generally used is to have an incandescent lamp on a long cord, the latter dragging on the floor, as the lamp is moved from one portion of the room to another. A better plan is to stretch a steel wire down the center of the aisle, high enough above the floor to be over the heads of the clerks. At points 2 ft. apart, rings are fastened, as shown. The lamp cord will be out of the way, and protected from injury.—B. E. Waller, Omaha, Neb.



The Light is Moved Along the Wire, and the Cord does Not Drag on the Floor

Brake Band Repaired with Spring-Steel Strap



The point at which the brake band of an automobile usually breaks is opposite the opening, as shown in the sketch. I found that, by making a repair at this place with a strap of spring steel riveted into place as detailed, the brake band was stronger than when originally fitted. The spring steel at the break gives the band elasticity, and its strength is equal to, if not greater than, that of the metal where the break usually occurs. When I bought two new brake bands, I had them sawed in half at the point where the break usually occurred and joined by this method.—C. H. Thomas, Kennett Square, Pa.

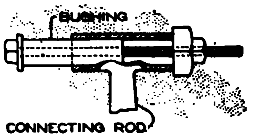
Rubber-Covered Instrument Knobs Made from Sink Stoppers

The furnishing of suitable knobs for rotating shafts on small instruments, and similar constructions, is often a problem to experimenters. Many forms of cheap and attractive insulated handles, or knobs, can be made by fitting rubber sink stoppers, or even chair-leg tips, to common wooden, or other, knobs. The addition of these soft-rubber coverings is desirable where a firm grip for turning a shaft is necessary. —R. U. Clark, III, Newton, Mass.

Small Floor Pit Convenient for Sheet-Metal Work

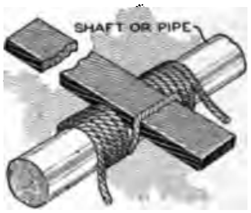
In a shop where much cutting was done with large hand shears, it was found that the most convenient way to do this work was to provide a pit in the floor, about 30 in. deep and 4 ft. square, in which the workman stands. This gives him a large working area on the floor around the pit. The work is brought to a good level for convenience in cutting, and where long strips are to be cut, the large floor area is desirable. The tiresome stooping to the floor is avoided, a feature which appeals to the man on the job.—Lee M. Delzell, Maroa, Ill.

Inserting Bushings in Motorcycle Connecting Rods



An easy method of inserting bushings in connecting rods of motorcycle engines is to pass a machine bolt of sufficient size and length through the bushing and connecting rod, as shown. Run the thread up to within 1 in. of the head. Place a 3/8-in. washer on the bolt next to the head. Put the bolt through the bushing and connecting rod. Then put a large washer next to the connecting rod. Put a nut on the bolt and draw it up, until it pulls the bearing into place, and without marring the bearing surfaces.—Walter B. Raynor, Patchogue, N. Y.

Pipe Wrench Made from Rope and Wooden Strip

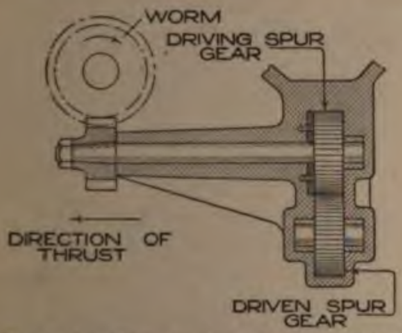


When a pipe wrench is needed for turning or holding pipe, and none is at hand, a substitute can be made of a wooden strip and a piece of rope. Lay the strip across the pipe as shown, and wind the rope around the pipe and over the strip, so that the latter acts as a lever. The rope should, of course, be fastened so that the pull is in the desired direction.—C. M. Hall, St. Louis, Missouri.

Bronze Disk Takes Up Thrust Wear in Pump

The oil pump of a gasoline engine revealed a gradual drop in pumping capacity and an examination showed that the driven spur gear was subjected to a great longitudinal thrust due to the action of the driving worm. This thrust resulted in the inner wall of the pump case becoming worn, allowing the oil to leak past the gear teeth so that the pump lost a great amount of its pumping force.

A repair was necessary and it was accomplished in the following manner: The pump was dismantled and found to be worn out in the casing wall to a depth of 1/16 in. A hole equal in diameter to the outside diameter of the gear and 1/4 in. deep, was bored in the casing on the side subjected to the thrust, and a bronze disk inserted in the hole. This was held in position by two 1/4-in. headless machine screws.

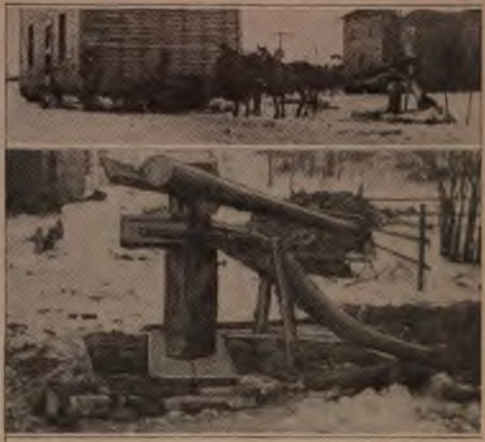


The Cavity Worn in the Casing was Filled by a Bronze Bearing Plate

The disk acted as a sort of thrust plate and instantly brought the pump up to its normal pumping capacity. A new disk replaced the worn one from time to time, so that the least bit of wear was quickly counteracted.

House Moved over Snow with Makeshift Capstan

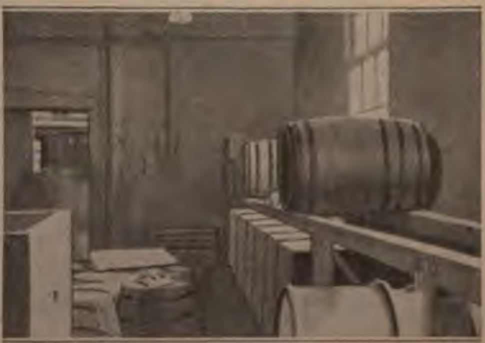
On a house-moving job here recently, the movers rigged out a capstan that did the work in first-rate shape, and as will be seen from the photographs it was quite crude as compared with the usual capstan for this purpose. A fork of a tree was strongly braced to a heavy timber foundation, and a vertical drum for the capstan was mounted in it. This made a more convenient arrangement than the usual support of two or four upright pieces braced together. The building was moved nearly one-half mile in 40 hours, over very rough and hilly ground, by two men with the aid of one team.—W. E. Covert, Grande Prairie, Alta., Canada.



The Building was Moved Nearly One-Half Mile over Rough Ground by the Use of This Makeshift Capstan Built of a Large Tree Fork

Runway over Oil Tanks Saves Lifting of Barrels

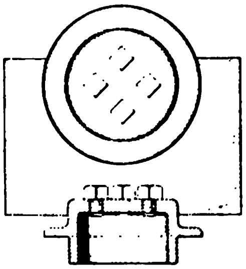
Shops using several grades of oil will find it convenient to build a runway or track above their oil-storage tanks, as shown in the photograph. When it is necessary to renew the storage supply,



The Barrels or Drums are Rolled into Position and the Contents Transferred the barrels, or drums, in which the oil is shipped, are rolled up an incline to the track, and thence along the track to the tank to be filled. A saving of many hours of labor resulted from the adoption of this plan in a large shop, as compared with the pump or dipping method of filling the tanks.—K. M. C., Webster Groves, Mo.

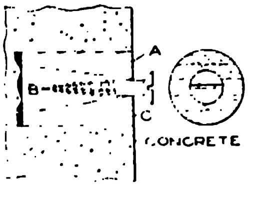
Square Wrench Seat Fitted on Tank Filler Cap

The filler cap on the gasoline tank of an automobile was of circular shape, and was extremely hard to remove when it was necessary to refill the tank. I decided to improve it in some manner so that a wrench could be used. I took four square-headed machine screws and set them in the top of the cap, as shown in the illustration. The wrench could then be applied with ease, and the cap was quickly removed.—Adolph Klein, New York, N. Y.



Wooden Expansion Plugs for Screws Easily Made

A wooden expansion plug for holding a screw or bolt in a concrete wall may be made quickly, as shown in the sketch. A round wooden 1-in. plug is sawed diagonally, so that the cross section will show three parts, A, B, and C. The plug is placed in the drilled hole in the wall, and the screw started in the wedge end of B, expanding it tightly against the other sections. The wedge tends to press A and C more tightly against the walls of the hole under an outward pressure. The plugs are best uniformly machine cut.

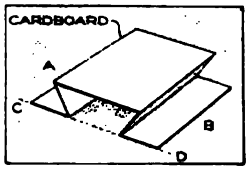


Old Paintbrushes Provide Small Tool Handles

When paintbrushes become worn out they are usually thrown away or burned. By saving the handles of these brushes, especially those of the heavier round type, the home mechanic can keep his tool box well stocked with extra handles for small files and other tools. The brush handle can be quickly trimmed to shape with a jackknife, and the end cut for a ferrule, flattened to an oval if necessary.—Frank Jableenik, Chicago, Ill.

Printing-Press Gauge Pins Made of Paper

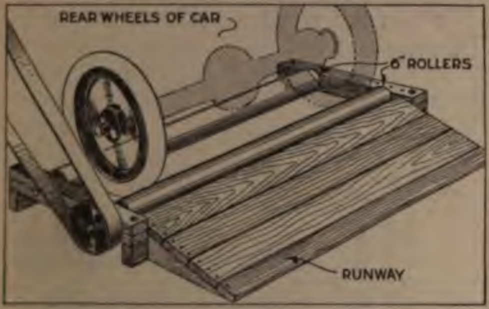
Printers, when doing work with narrow margins, often find that the gauge pins they commonly use are in the way of the grippers. Instead of using a regular-style gauge pin, a homemade substitute, which is perhaps better since it can be flattened out by the tympan clamps with each impression without doing it any harm, can be used. It is made from a piece of light cardboard, or stiff paper. The paper is folded, as shown, and the ends A and B are pasted at C and D, along the line where the paper will be fed.—Joseph Thalheimer, Jr., Venice, Calif.



Auto Used as Power Plant without Altering Car

An automobile may be utilized to furnish power for operating small machinery without altering the car in any way, by the use of the driving rigging shown. All that is necessary is to back the automobile up the slight incline, and leave the gears in mesh with the engine running. The tires transmit the power to the 6-in. rollers, and they, in turn, to a belted drive pulley. The wooden rollers are 6 ft. long. Each end is fitted with an axle, 1 ft. long, sufficiently heavy to bear the weight of the automobile used. Two wooden bearing boxes are built of 3-ft. pieces of 2 by 4-in. hard pine, bolted together and bored through the middle, for bearings, where the two faces come together. Small holes are also bored down through the top piece for lubrication. The rollers are assembled with ring washers against their ends, and the bearing boxes are bolted together with two braces. The pulley on the projecting end of the driving axle is set with a setscrew.

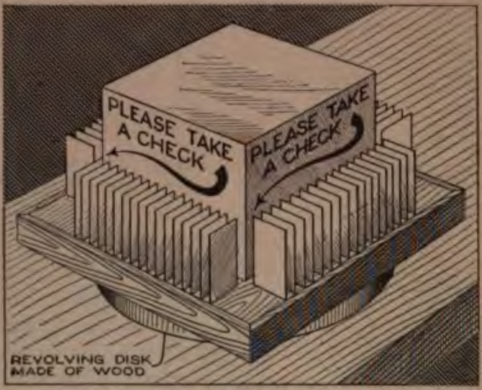
A slanting platform, as shown, makes it easy to back up the car on the rollers. The distance between the rollers depends on the diameter of the wheel of the car being used, but for general purposes a space of 18 in. between the two sets of bearings will give ample room for the average auto wheel to come well down between the rollers and insure good traction.



The Rear Wheels of the Automobile are Run onto the Rollers, and Transmit Power to the Drive Pulley

Revolving Check Holder for Lunch Rooms

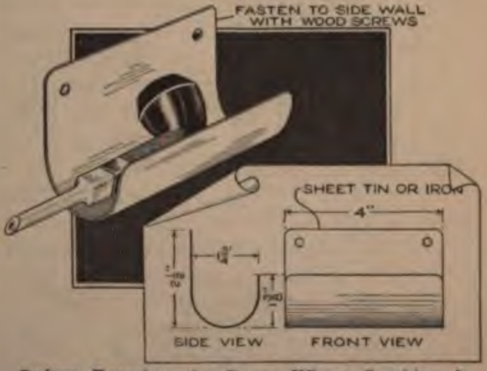
Instead of having a person at the door to hand out checks during the busy hours, a lunch room uses several holders of a type shown in the sketch. They are filled by the cashier during the part of the day when the patronage is light. As the patrons enter they pick their own checks from the holder, the arrow indicating which end the check should be taken from. The cardboard box in the center, on which the directions are marked, is lifted off, and the rack for the ticket replaced as required. The rack is pivoted on the center of the wooden base with a bolt.
—L. E. Turner, Brighton, Mass.



The Patrons Take Their Checks from the Holder Which is Provided with a Filled Rack as New Checks are Needed

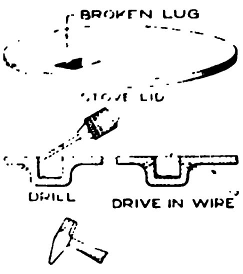
Racks for Pipes and Cigars Aid "No Smoking" Enforcement

Considerable trouble was experienced in a large factory where smoking was forbidden in certain of the departments, because lighted cigars, pipes, and cigarettes were carried by persons entering the room to remain only a short time. As a result, racks made of sheet metal, as shown, were provided at the doors, and a suitable sign placed over them. The rule against carrying lighted tobacco in various forms was rigidly enforced and hearty coöperation of the men was gained.



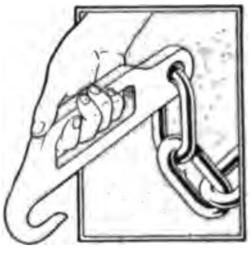
Before Entering the Room Where Smoking is Forbidden, the "Smoke" is Placed on a Rack at the Door

Stove-Lid Lifting Lug Repaired with Wire



A neat repair was made when the cast lug on a stove lid broke, by setting a piece of wire across the lifter socket, by the method shown in the illustration. The hole was chipped clear, and holes for the wire were drilled through the sides, at a slight angle, as indicated. The wire was driven through from below, cut off to the proper length, and hammered into place. The bend which the wire must be given to fit into the holes, can be determined easily by a test, the wire being bent with the aid of pliers.—Edwin J. Bachman, Jr., Fullerton, Pa.

A Pulling Hook with Safety Finger Hold

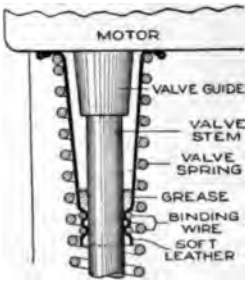


Where hooks of the ordinary design are used on the end of a chain, or line, for pulling objects around by power, on cranes, etc., accidents occur frequently. The man whose work it is to engage the tackle may try to place the hook in the hole, or fitting, "on the fly," and smashed fingers may result. The safety-first hook shown has a finger hole whereby it may be held without danger. The proportions of such a hook will vary in accordance with the work to be handled. The size of the finger opening should be about 1½ by 4 in. Where the service is not too severe, these hooks may be cut and forged from sheet-steel plate.—E. D. Clifford, Chicago, Ill.

Handy One-Man Method of Using Tapeline

If proper care is taken, measurements can be made with a tapeline by one man with as much accuracy as if an assistant were setting the end of the line. A 6-in. brad awl is set carefully at the mark from which the measurements are made, the point passing through the end loop of the tapeline. While the device is especially useful on wooden structures, it can also be used handily on brickwork, by making the measurements from wooden trimmings, and deducting the lengths which are not to be included in the measurements.

Leather Cap Remedies Loose Auto-Engine Valve

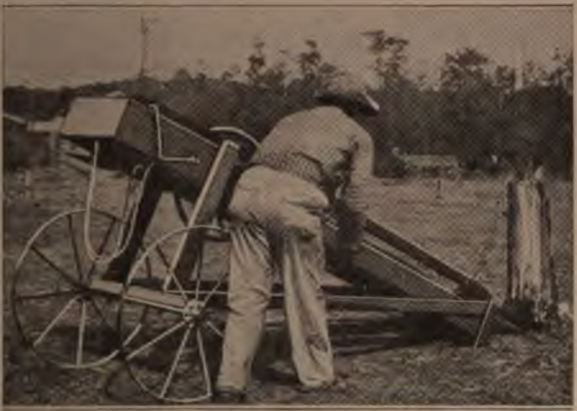


When the valve guide and valve stem became worn on an automobile engine, an extra amount of air was sucked in, weakening the mixture coming through the carburetor, thereby causing much trouble. To eliminate this, I shaped a piece of soft leather to fit on the inside of the valve spring. I put a piece of wire around the top to stiffen it and attached the cap to the valve stem at its lowest point of motion. Grease was added, as shown, acting as a lubricant and aiding in keeping out the air. The device is held in place by the pressure of the valve spring, and the leather, being soft, allows for the movement of the valve.—A. Elting, New York, N. Y.

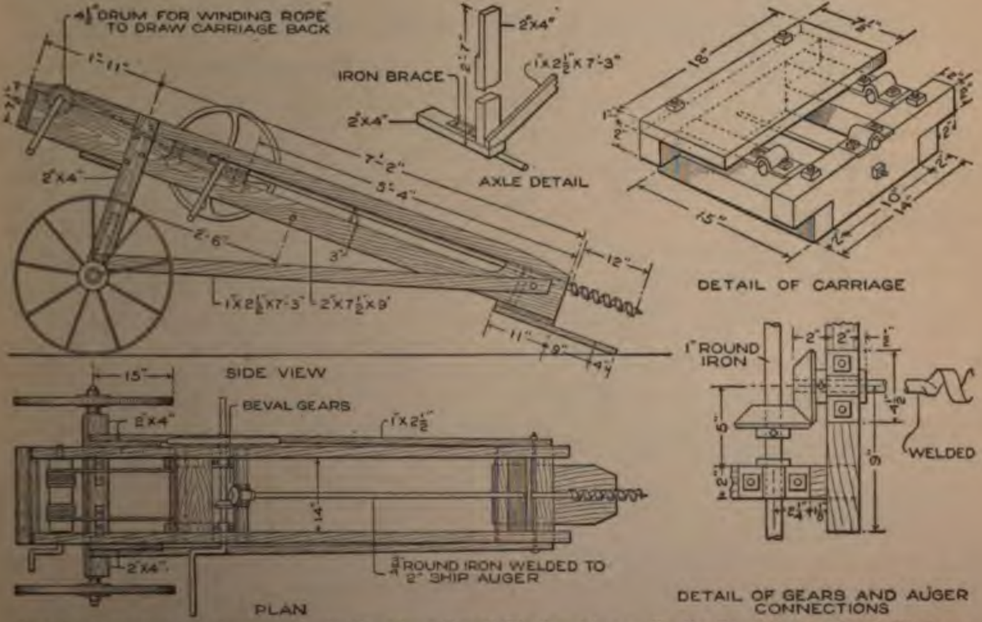
¶When drilling holes in small pieces of metal, especially where a brace or breast drill is used, and no vise is at hand, hold the piece with a monkey wrench, so as not to harm the hands, or weight the wrench, if both hands are needed for drilling.

Homemade Stump-Boring Machine an Aid to Settlers

By E. R. McINTYRE


This Stump-Boring Machine of the "Day" Type Is Very Efficient for Preparing Stumps for Blasting in Clearing Land

AN inexpensive, homemade stump-boring machine is being used extensively by settlers in getting the tough, deep-rooted, long-leaf pine stumps of Mississippi in shape for blasting, in the process of land clearing. Those who have fair mechanical experience build the machine themselves, buying only the necessary metal parts, and local blacksmiths build the outfits at a cost of not over $30. The inventor gave the machine to the settlers for use in de-



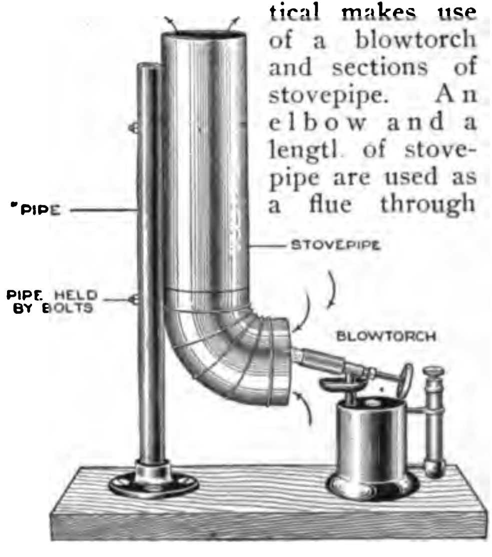
The Construction Is Comparatively Simple: a Local Blacksmith can Easily Provide the Metal Fittings, and the Wooden Parts can be Made in the Farm Workshop velopment work. This method of boring stumps for blasting is practical for use in many other sections of the country. In a recent test at the Mississippi Agricultural Experiment Station, one man in five hours bored through 27 stumps, averaging 18 in. at the top and 22 in. diagonally, as bored, in diameter.

The construction of the machine, as detailed in the working drawings, is comparatively simple. The large wheels make it easy to transport the outfit, which is set up, when in use, as shown in the photograph. The holes are bored by a 2-in. ship auger, which is welded to a ¾-in. round-iron rod. The power is transmitted to this rod from a crankshaft, geared to the auger rod. The crankshaft and the beveled gear at the upper end of the auger rod are mounted in a carriage, shown in detail. This carriage slides in ways cut into the sidepieces of the frame. The carriage is drawn up, in removing the auger from a bored hole, by means of the drum and ropes at the upper end of the frame. The connections of the auger rod and its driving arrangement are shown in detail. The crankshaft is made of 1-in. round iron bent at one end to form a handle. A flywheel is set on the other end.

The upper end of the main frame is about 5 ft. from the ground. The elevation of the frame, in this manner, braces it against the stump in boring, and brings the crankshaft to a height at which it can be easily turned. It also causes a slight pressure against the auger, which aids in boring steadily at a diagonal, yet does not hinder withdrawal of the auger.

Heating a Small Workshop by Means of Blowtorch

A method of warming the small shop on wintry days that is novel and practical makes use of a blowtorch and sections of stovepipe. An elbow and a length of stovepipe are used as a flue through which the hot air from the flame of the blowtorch passes. As the heated air rises in the pipe, cold air is drawn in at the opening around the flame, as indicated. The supporting standard is fastened to a base of suitable size, and the pipe is fastened with bolts. The torch should be placed so that the end of the flame just enters the end of the pipe.—Kenneth M. Bard, Manawa, Wisconsin.



This Arrangement was Successfully Used to Warm a Small Shop When the Thermometer Outside Stood below Zero

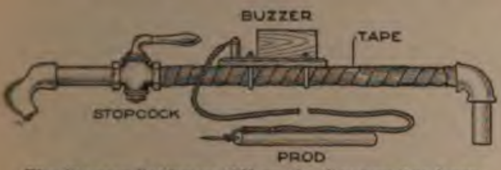
Methodical Oiling of Automobile Proves Economical

Proper lubrication is one of the most important factors in the preservation of the life of an automobile. The best way to oil the machine is to do it methodically. A procedure that is thoroughly satisfactory, and which does not require a chart of the type in quite common use, is to "map out the oiling campaign" on the car itself. Give every oil hole and every place to be oiled a number, running serially from 1 up. Starting with oil hole No. 1, stamp it with a small die-stamping outfit. At hole No. 10, stamp that number, and stamp each tenth hole thereafter. Then, in oiling, proceed from the first hole, keeping a mental count. If the count agrees with the stamped figures, probably no points have been overlooked.—G. N. Near, New York, N. Y.

Device Aids in Filling Storage Batteries

Storage batteries of the sealed type are difficult to fill, and when a number of cells require filling at one time, it is tedious to watch the height of the solution. The device shown in the sketch audibly indicates when the battery is properly filled. It consists of a length of iron or brass pipe, provided with a stopcock as shown. A short length of lead pipe is fitted into the elbow. The lead pipe should be of such a length that when the longer pipe is laid flat on the top of the cell, the lead pipe is within ¾ in. of the plates. A small buzzer is mounted on the pipe, one terminal being connected thereto. To the other terminal of the buzzer connect a length of stranded lamp cord, attaching the latter to a steel point fitted into a short stick.

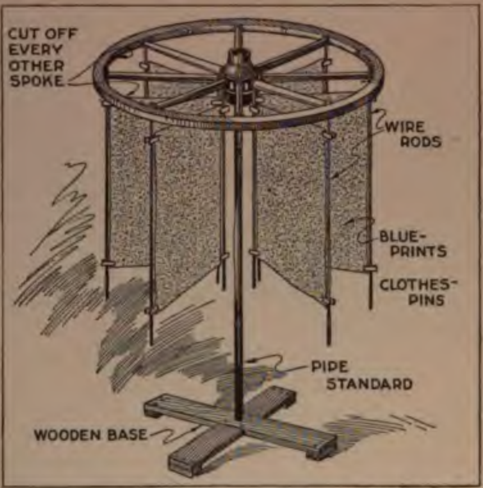
The filling tube is connected to the water supply by means of a rubber hose. In use, the short pipe is inserted into the vent in the cells; the steel point is then forced into the terminal on the battery, spanning at least one cell. When the electrolyte has reached the proper height, the circuit is closed, and the buzzer announces the fact.—Thomas W. Benson, Philadelphia, Pa.



The Buzzer Indicates When the Battery has been Filled to the Proper Height

Wheel Arrangement for Drying Blueprints

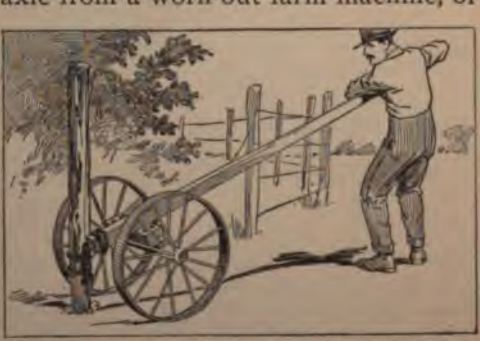
A handy arrangement for drying blueprints, and insuring that they will be reasonably flat, can be made by mounting an old buggy, or light wagon, wheel on a pipe standard, as shown in the illustration. Every other spoke is cut out. Two stiff wires are suspended from each spoke, the blueprints being stretched between the wires and held by spring clips, or clothespins. The wooden base is set in a suitable trough, into which the water from the prints drips. If they are given a slight preliminary drying, the arrangement may be used on a wooden floor.—Joseph Thalheimer, Jr., Phoenix, Ariz.



The Blueprints are Stretched between the Wires Suspended from the Spokes of the Pivoted Buggy Wheel

A Post Extractor Mounted on Wheels

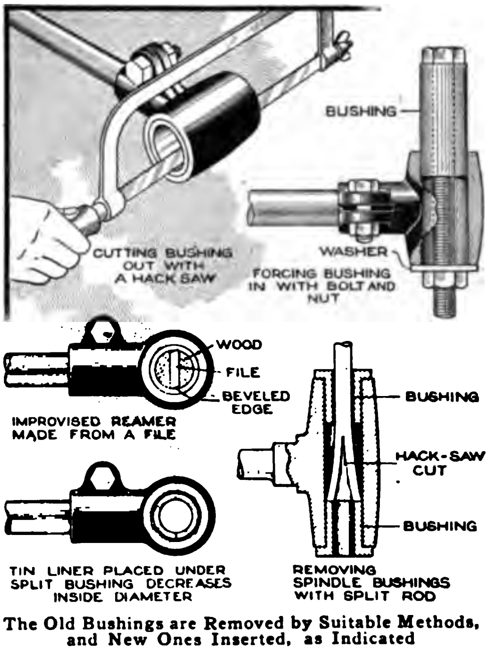
A type of post extractor, which has long been in use by circus men and tent gangs, can easily be adapted for use by farmers, or others who find it necessary to repair or remove fence posts. An old pair of wheels and an axle from a worn-out farm machine, or



The Post is Quickly Withdrawn with Slight Effort, by Bearing Down on the End of the Lever wagon, provide a suitable truck. A heavy piece of hard wood is bolted to the axle, as shown, and an old wagon pole, or even a timber cut from a small tree, can be used for the lever. The wheels may also be made solid, of wood spiked together in cross layers. The operation of the outfit is simple: A chain is formed into a sling around the base of the post and hooked over the short end of the lever. By bearing down on the other end of the lever, the post is withdrawn. Usually, several holds must be taken with the chain to pull out the post completely.—C. L. Moore, Cleveland, Ohio.

Removing and Replacing Automobile Bushings

Worn bushings in an automobile cause lost motion in the connected parts, as well as undue vibration and noise. The bushings in the steering connections and spring shackles are readily replaced, with the least dismantling of the parts, by the use of a hacksaw and a bolt, with a nut to fit. The blade of the saw is disconnected at one end and placed inside the bushing, as shown. The saw slot cut permits the bushing to be easily removed. To force the new bushing into place, it is filed slightly at one end to start it into the hole. Place the bolt through, and slip a washer over, to make the nut turn easily. A wrench at each end will force the bushing into place. After the bushing is in place, the pivot pin or bolt will probably be too large to enter. For increasing the inside diameter of the bushing, a discarded file makes an excellent reamer, when ground as shown.


BUSHING
CUTTING BUSHING OUT WITH A HACK SAW
WASHER
FORCING BUSHING IN WITH BOLT AND NUT
WOOD
FILE
BEVELED EDGE
IMPROVISED REAMER MADE FROM A FILE
BUSHING
HACK-SAW CUT
BUSHING
TIN LINER PLACED UNDER SPLIT BUSHING DECREASES INSIDE DIAMETER
REMOVING SPINDLE BUSHINGS WITH SPLIT ROD

The Old Bushings are Removed by Suitable Methods, and New Ones Inserted, as Indicated

Sometimes new bushings are not at hand, in which instance a liner of tin, if fitted around the outside of the split bushing, will reduce the inside diameter sufficiently to be of further service, as shown. Another bushing remover, which is useful for removing the end bushings in the wheel spindles, is made by using a metal rod as shown. Splitting one end of this with a hacksaw and bending the ends apart, makes it ready for use. The ends are sprung together and placed through the upper bushing, after which they will spring open. A hammer is used to drive out the bushings. Coating the exterior surface with grease or graphite grease helps to reduce the labor of replacing the bushings.—G. A. Luers, Washington, D. C.

Cutting Drafting Sheets Quickly from Roll of Paper

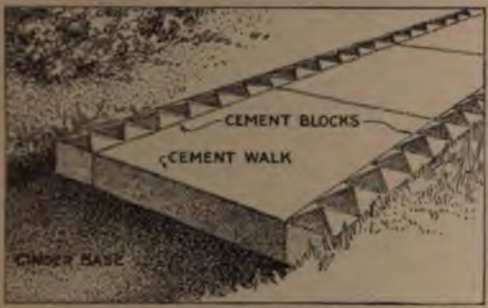
In cutting sheets from a roll of paper considerable stock is often wasted by carelessness in tearing or cutting the paper. A good plan is to unroll the roll to the size of sheet desired, and then to use the edge of the roll as a pencil guide in marking a cutting line. When a number of sheets of the same size are to be cut, and they do not extend the full width of the roll, a section of paper may be cut off and rolled up; the width of the sheets is then marked along the length of the roll, and the roll cut through at one stroke. The resulting strips are then cut to length. —F. B. Mallory, Flemington, N. J.

Sandpaper Finger Tips an Aid in Feeding Press

In feeding a printing press rapidly, the bare fingers smear the ink when the sheet is pulled off. Instead of winding a strip of sandpaper around the finger, cut round disks of coarse sandpaper a little smaller than a dime, and glue disks on the tips of the first and second fingers. This method enables the feeder to get the printed sheet every time, and does not smear the work.—H. S. Hart, Shreveport, La.

Concrete Borders on Walks Protect Grassplots

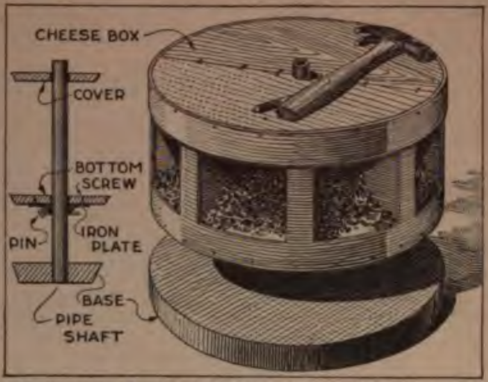
Careless pedestrians often ruin lawns along the edges of walks, even though the walks are of sufficient width. A good method of overcoming this temptation to make a path on the grass bordering the walks is to set a row of low concrete pyramids along the edge of the walk, as shown. They may be cast in blocks, or built in a continuous strip with the walk.



The Pyramid Borders Keep Pedestrians on the Walk and Protect the Adjoining Grassplots

Revolving Nail Holder Made from Cheese Box

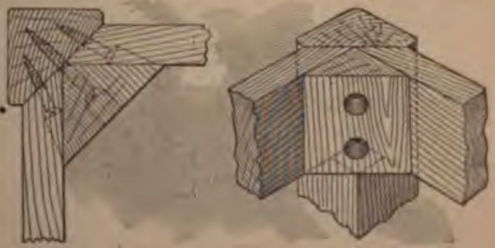
A shop contrivance that saves much time and is a help in keeping the shop in order was made from an old cheese box, and provides for nails and other small hardware. Compartments were fitted in the box radially, like the sections of a pie, and openings cut into the sides of the box, as shown. The box was then mounted on an iron pipe, set in a wooden base. An iron flange plate was fastened to the bottom of the box, and provides a good bearing for a large cotter pin set through the pipe as a support for the box.—F. E. Brimmer, Dalton, N. Y.



The Various Kinds of Nails and Small Hardware are Placed in the Compartments, and Conveniently Removed by Revolving the Cheese Box

A Strong Table Frame Quickly Made

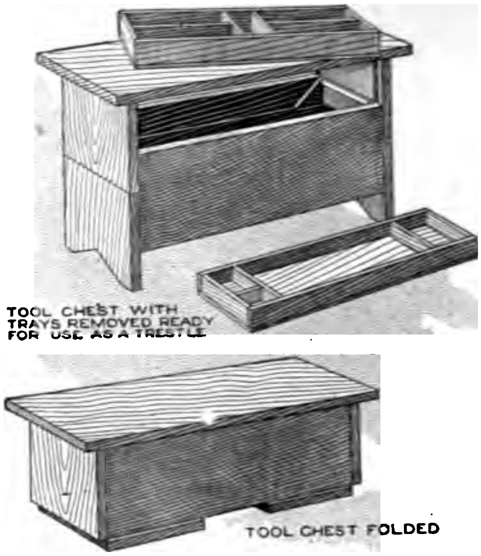
A common practice in making cheap tables is to end-butt the sides into the legs, connecting the sides by a bridge piece and fastening the latter with screws. The screws need frequent tightening, because of shrinkage and vibration. The method shown is stronger and quicker: Saw out the triangular portion at the top of the leg, and surface the cut with a sharp chisel and block plane. Miter the ends of the two sides against the surface, as shown, and fasten the joints with glue and screws. Reverse the portion cut out from the leg, and fasten it into the corner.—Henry Simon, Laguna Beach, California.



This Table-Frame Joint is Quickly Made and Very Strong

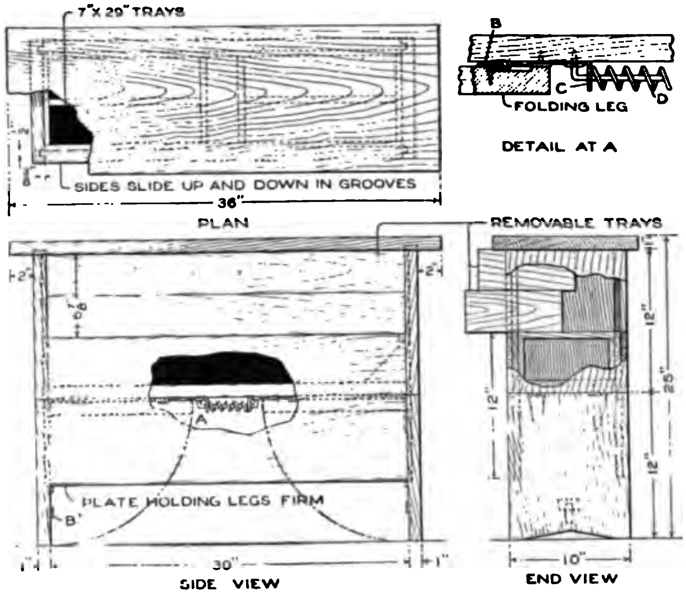
Combination Tool Chest and Trestle Folds Compactly

The mechanic who has small repair jobs to do in various places, making it necessary to carry tools and sawhorses, as well as the home mechanic who has use for a compact jobbing outfit, will appreciate this combination tool chest and trestle. When folded, as shown, the chest is compact, and affords a good handhold at each end of the top for convenience in carrying. On the job, the lower ends of the legs are folded from under the tool chest, the sides of the latter sliding down to the position shown in the upper sketch. The trays fit inside of the raised sides and can be removed easily. The top of the trestle gives ample space for work, and as a rest for sawing.


TOOL CHEST WITH TRAYS REMOVED READY FOR USE AS A TRESTLE
TOOL CHEST FOLDED

The Combined Tool Chest and Trestle Folds Compactly for Convenience in Carrying, and, When Opened, Provides a Substantial Support

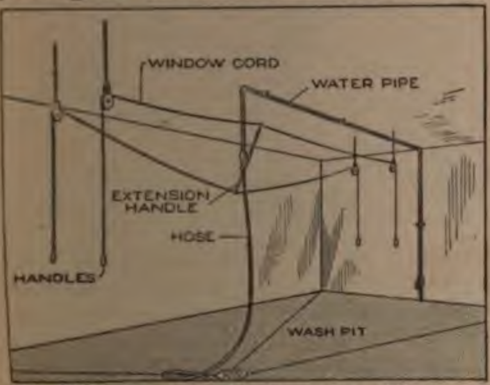
The construction is detailed in the working drawings. The end supports are hinged across the middle, their inner edges are grooved, and the two sides of the tool compartment slide in the grooves, as detailed in the plan. The lower tray rests on strips at each end, and the upper one slides on the lower. When the outfit is closed, the lower ends of the support are folded under the tool compartment, the sides being raised in their grooves to their position under the top. The folding ends are locked, at A, by a spring device, shown in detail. A small metal plate, B, is fitted over a part of a shallow mortise in the inner side of the leg, at B, in the side view. Two angles of metal, C, are mounted on a rod, and held apart by a coiled spring, D. When the legs are folded into place, the angles C are pressed together between the thumb and first finger, and their sliding ends permitted to catch under the small plates B. The spring D holds the angles in this locked position. The other details of construction



Details of Construction: The Outfit is Shown with the Side Panels Lowered in Their Grooves, and the Trays Partly Removed. The Lower Ends of the Supports Fold under the Bottom, as Indicated in the Side View, and are Locked by the Mechanism Shown in the Detail at A are simple, and are shown in the dimensioned working drawings and sketches. — George H. Jackson, Toronto, Ont., Canada.

Overhead Controls for Garage Auto-Washing Hose

In a large auto garage where water was used through a meter, it was found that ordinary shut-off nozzles on the ends of the hose used for washing automobiles were not desirable because of the danger of scratching the finish. A large waste of water resulted by the use of a hose without a means of shutting off the water close at hand. As a result the overhead-control system shown in the sketch was installed, and worked satisfactorily. By this means the operator can shut off the flow of water from his position at any one of the four corners of the machine, by pulling on the nearest control handle.

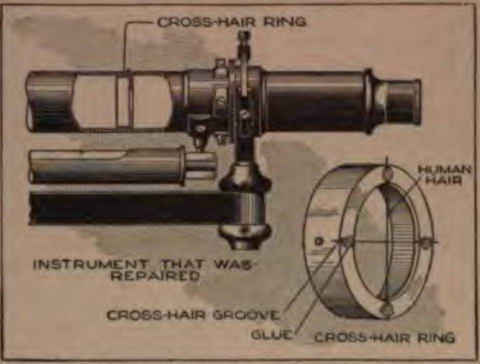


The Water Supply for Washing Automobiles in a Garage was Controlled Conveniently by This Overhead Arrangement

A valve was set at the end of the water pipe near the ceiling, and its stem was fitted with a lever, as shown, to which the four control cords were attached and run through pulleys.—Robert L. Cook, Madisonville, Ky.

Repair for Broken Cross Hairs in Surveyor's Level

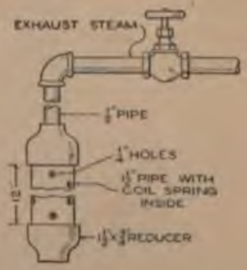
A sudden jar or fall of a surveyor's instrument sometimes causes the hairs to break from the cross-hair ring in the level, and usually the instrument is sent back to the factory for repairs. When an emergency repair was necessary, a method was devised which proved of permanent value. The instrument was disassembled and the cross-hair ring removed. The grooves for the hairs were cleaned, and two human hairs were glued into place, as shown. The glue was applied hot, and the hairs were drawn taut across the notches. In a similar repair, carbon filaments from an electric-light bulb were used and proved serviceable, but were harder to put into place because of their brittleness.—A. P. Midland, New York, N. Y.



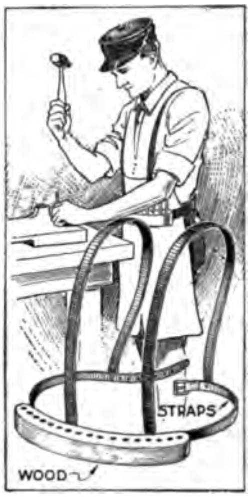
Human Hairs were Glued into the Cross-Hair Ring of the Surveyor's Level and Provided a Satisfactory Substitute for the Broken Cross Hairs

Muffler for Injecting Steam into Water Tank

The sketch shows a muffler, which I am using in a feed-water tank, or hot well, as the marine engineer calls it, for stopping the noise created when steam is used for heating water. It consists of a 1½-in. pipe, 1 ft. long, perforated by ¼-in. holes, all around. I filled the pipe with light coil springs from pumps, and reduced the bottom end to ¾ in. and the top to ½ in. and fitted the pipe on, as indicated, with a control valve.—Richard Alte, Baltimore, Md.



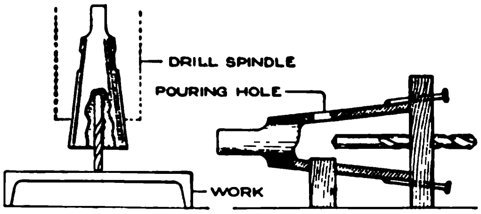
Holder for Marking Punches Strapped to Workman's Belt



Especially in the machine industries, it is a common practice to mark various parts before assembling them, and the workman who does this must go from place to place with his set of steel marking punches. It is unhandy to carry these in the box usually provided, and a wide-awake mechanic rigged out a harness - and - belt arrangement, as shown, which proved to be very convenient. He made a curved piece of wood to fit the body at the waistline and attached the straps to it. The punches are carried in holes in the wooden piece, and are handy to get at.—C. C. Spreen, Flint, Mich.

Babbitting Drill in Drill-Press Spindle Avoids Heavy Work

Some castings were to be drilled, and the only means at hand were a hand breast drill and a heavy radial drilling machine. The chuck of the machine was 4 in. too low, in its upper position, to permit the castings to fit under it. The job was accomplished by babbitting a drill in one of the sockets used to reduce the size of the spindle hole for small taper-shank drills. To hold the drill in place while pouring the babbitt around it, the rigging shown in the sketch was used. The drill was set into the center of a wooden block, held in place as indicated. The socket was suitably plugged, and the metal poured in. The chuck was taken out of the spindle, and the socket became practically a chuck, saving enough height on the spindle to make room for the job.



A Tedious Hand-Drilling Job was Avoided and the Work Turned Out in Short Order on a Drill Press by the Method Shown

Tin and Celluloid Cover Protects Shop Tally Cards

Inspectors in manufacturing plants, and checkers who use tally cards to check up the work turned out, find difficulty in keeping their records clean and neat. A large automobile plant has provided, for inspectors, holders made of tin as shown. Three of the edges are turned over to form a groove for the card, and transparent celluloid covers the card and also slides in the grooves. The tin provides a base for the card, and it is necessary to withdraw the celluloid only sufficiently to expose the card as desired.—J. S. Hagans, Toledo, Ohio.

Liquid Shoe Polish Used as Auto Radiator Paint

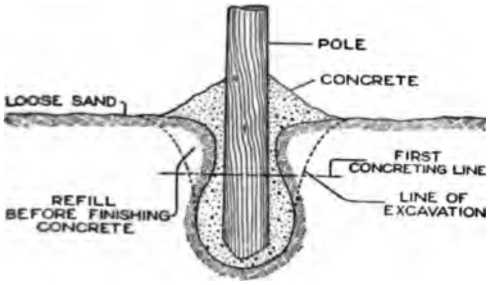
Because of the difficulty of getting into the spaces in an automobile radiator to clean or paint them, this part of a car is often neglected. The appearance can be improved by painting the webbing with black, liquid shoe polish, diluted to the proper consistency. A convenient method of applying the paint is to use the dauber which usually is attached to the cork of the bottle.—G. A. L., Washington, D. C.

Paraffin Repairs Small Holes in Cold-Water Tank

When a copper-lined, or porcelain, tank for cold water leaks from small holes, dry off the surface thoroughly with a rag. Then locate the leak, and pour hot paraffin on it. In an emergency, drops of wax from a candle will also do the work. This will often give years of life to such a tank.—Joseph J. Jiannotto, Brooklyn, N. Y.

Substantial and Economical Concrete Base for Poles

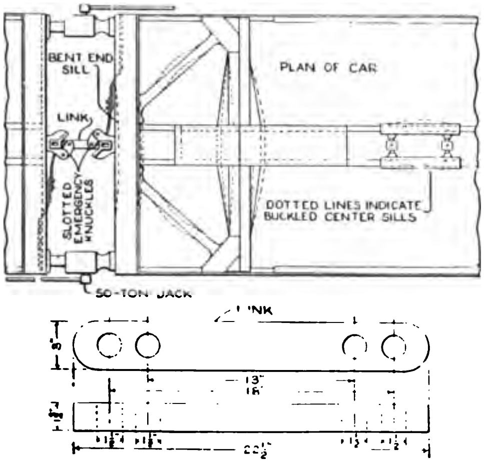
In setting telephone poles, and poles for similar service, in loose sand or gravel, the method shown was used with excellent results. The cup-shaped hollow below the heavy line was first concreted around the pole and then the refill, noted above, was put in place and the concreting finished. The refill is advantageous both because of the narrow girth it gives to the concrete around the bottom of the pole, thus being harder to pull out of the ground, and also because of the saving in cement.—Roy H. Poston, Flat River, Missouri.



This Type of Base for Poles Is Strong, and Economical of Concrete

Method of Straightening Freight-Car Frames

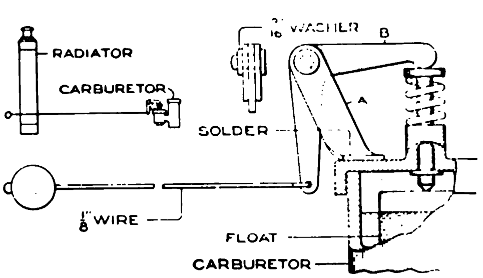
The drawing shows my design used on many cars for straightening center sills, end sills, body bolsters, and braces by pulling out the stoved-in ends of cars with powerful jacks. A link, shown in detail, is fitted to the couplers, and the jacks are placed against the end sills, pressure being applied by means of levers. The dotted lines indicate the buckled portions to be straightened.—John W. Shank, Renovo, Pa.


BENT END SILL
PLAN OF CAR
LINK
SLOTTED EMERGENCY KNUCKLES
DOTTED LINES INDICATE BUCKLED CENTER SILLS
50-TON JACK
LINK

The Car Frames are Straightened by the Use of Powerful Jacks

A Tickler for Priming Carburetor

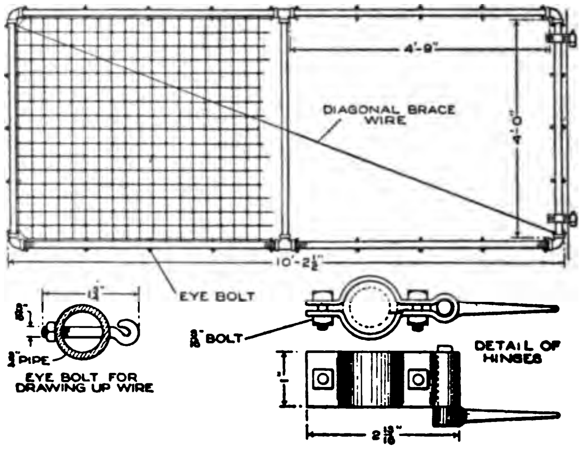
A kink that the autoist will appreciate is for priming the carburetor without the necessity of lifting the hood. Two small strips of steel, A, are soldered to the top of the float cover. With the aid of a steel pin, a hinge is formed for the crank B. This is also made from strip steel. A steel wire runs from the crank, through and to the outside of the radiator. A pull on the wire pushes down the plunger of the tickler, causing the float to drop, and in this manner the carburetor is primed.



By Drawing on the Wire at the Radiator, the Carburetor is Primed without Raising the Engine Hood

A Strong Gate Built of Iron Pipe

A neat and substantial iron gate can be made in the home or farm workshop with iron pipe and fittings. A practical design is shown in the illustration. The gate is made as follows: Prepare four pieces of ¾-in. galvanized-iron pipe, 5 ft. long and threaded at both ends. Cut three pieces 4 ft. long. Four elbows and two tees are also needed. Fit the gate up, as shown, leaving out the two bottom pieces at first. These two pieces are made as shown, one end of each being threaded twice as far as the other end. Screw the long threaded end into the elbow as far as possible, then fit the other end to the tee and screw it into place. The long thread at the ell will become partly unscrewed as the short end enters the tee. Fit both pieces in this manner. The gate frame is now complete, and should be covered with woven-wire fencing. The detail shows the small eyebolts that support the wire and serve to draw it tightly in place. A diagonal wire brace is then put into place, and drawn tightly by twisting it or inserting a turnbuckle. The hinges are made from a piece of ⅛ by 1-in. strap iron, bent to fit around the pipe of the gate and clamped with a bolt, as detailed.—B. Francis Dashiell, Dunkirk, Md.

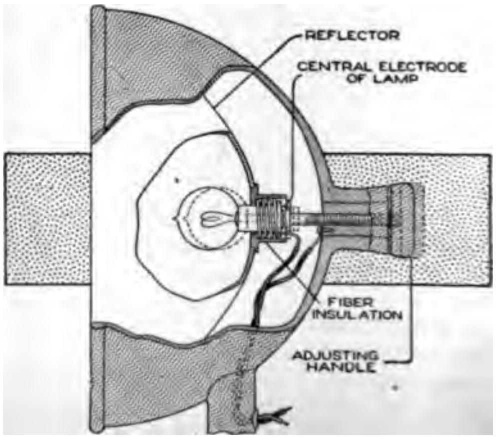


This Substantial Iron Gate can be Made in Various Sizes from Pipes and Fittings

---

Electric Auto Spotlight Arranged for Easy Focusing

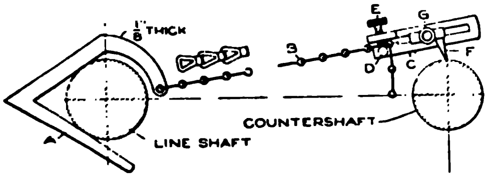
To secure a focusing arrangement that may be readily adjusted to suit various road conditions, I refitted the electric spotlight on my automobile as shown in the diagram. By turning the adjusting handle, the globe is forced in or out, as indicated by the dotted lines, causing the light to spread or be confined in a long, narrow beam, as desired. I sawed off the old handle of the lamp and fitted a bronze bushing into the end of the reflector extension. Into a disk, which forms the adjusting handle, I fitted a bronze screw, the head of which was ground to the shape of a nail head, as shown. This screw is set firmly in the handle, and is adjusted in the threaded bronze bushing. The end of the screw makes contact with the central electrode of the lamp. The lamp is carried in an insulation bushing and is fitted with a coiled spring, which forces it back into contact with the adjusting screw. The



A Simple Method of Adjusting an Auto Spotlight was Provided by Fitting the Reflector with These Special Parts wiring is connected up as shown, one of the wires being set in the bronze bushing by means of a screw, and the other fixed to the shell of the light-globe plug.—John E. Hogg, Alhambra, California.

An Alining Tool for Shafting and Machinery

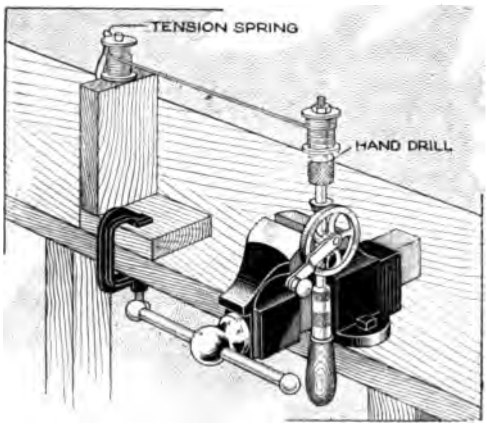
A handy tool, worthy of a place in any mechanic's tool chest, is an alining device, for determining parallelism of machinery shafts and fittings. The hook A is of 1-in. sheet steel, shaped as shown, and snaps over the first shaft. A flat-link brass chain, B, fastened at one end, is drawn through the head C to the approximate distance, and clamped to the stud D by means of the thumbscrew E. Final adjustment is obtained by moving the pointer F along the slot in which it is set, and clamping the thumbscrew G. In operation, the approximate adjustment is made at one end of two shafts to be lined up, and then the final adjustment is made. The distance is then scaled at several points on the shafting to insure accuracy.—J. B. Murphy, Plainfield, N. J.



Shafting and Other Parallel Machine Parts are Lined Up Accurately with This Handy Tool

Winding Small Magnet Coils with a Hand Drill

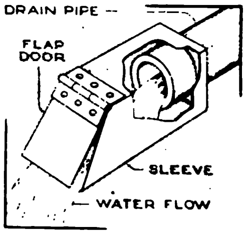
In the winding of a considerable number of small magnet coils, no lathe being available, the rigging shown was adopted. It operated very satisfactorily, and was reserved for future use. A small hand drill, clamped in a vise, was used in turning the spool upon which the coil was to be wound. The spool, as it was wound, was held on a bolt from which the head had been cut, and the bolt was clamped in the chuck of the hand drill. The spool of new wire was mounted on a bolt set in a suitable support, clamped to the bench top. To prevent the spool from unwinding too rapidly and to provide a tension on the wire, a brass spring was arranged to bear against one of the flanges of the spool. In operation, the crank of the hand drill is turned with the right hand, while the wire is guided onto the spool. After a couple of spools have been wound, the winder can be operated very rapidly and produces a neat coil.—C. A. Foster, Cincinnati, Ohio.



An Ordinary Hand Drill Mounted in a Vise Provides a Practical and Rapid Means of Winding Small Coils

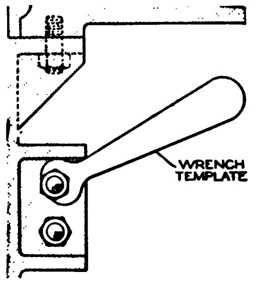
Preventing Rodents from Entering Drain or Sewer Outlets

A simple and effective device for preventing rodents from entering an outside drainpipe opening is made as follows: Construct a sleeve to fit over the open end of the drainpipe. The end of the sleeve is cut off at an angle, as shown. Hinge a heavy sheet-iron flap over the end of the sleeve. The weight of the flap keeps it closed and prevents the ro-



dents from entering. The force of the outflowing water opens the door and holds it open until the waste has passed. The current prevents the rodents from passing up when the door is opened. The device should be painted thoroughly, and the hinge kept oiled.—B. F. D., Baltimore, Md.

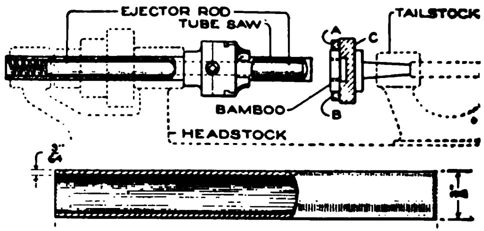
Wrench Template Saves Draftsman's Time



When designing machinery fastenings for close quarters, a convenient method of determining whether there is sufficient room for turning a wrench is to use a template cut from cardboard, as shown in the sketch. A set of these templates for common nut sizes can be kept on hand, in full or half size. A hasty layout of the doubtful corner is made, and the template gives the information required.—J. A. Ryan, Chicago, Ill.

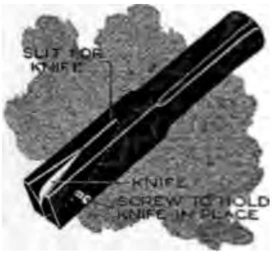
Hollow Drill for Boring Bamboo and Sheet Fiber

Holes cannot be bored in bamboo easily with ordinary drills, because of the ready splitting of this material. Having occasion to make several hundred ⅜-in. holes in narrow strips of bamboo, I made the tube saw shown. A ⅜-in. steel tubing, 3 in. long, with walls $^3/_{64}$ in. thick, was used. Saw teeth were filed in the trued edge of the tube, so as to lead the points toward the direction of rotation. The tube was held in the chuck of a lathe. A rod extended through the spindle of the lathe and inside of the tube, and was held in position by a spring. The rod automatically pushed out the centers as bored. A wooden pad, C, mounted on a taper stem at the tailstock, centered the strips of bamboo between blocks A and B. The tube saw is also handy for use on thin ivory, bone, fiber, hard rubber, and similar materials.—L. M. Drake, Daytona, Fla.



The Tube Saw Cuts Round Holes in Thin Material without Splitting It Easily

A Wire-Skinning Tool of Handy Size



To make a tool for removing the insulation from electric wires, and which is small enough to be carried in a tool kit, it is only necessary to have a short piece of ¾-in. iron bar, a portion of a hacksaw blade, and a setscrew. A slit is first cut in one end of the bar, and a shallow notch filed as shown. The saw blade is sharpened on the back edge, and inserted in the slit so that the cutting edge is out. A setscrew holds the blade in place. To skin the insulation from a wire, pass the latter through the notch. The knife edge will slit the insulation neatly, so that it can be easily pulled aside.

Substitute for Pipe Vise

Not having a pipe vise at hand when it was necessary to thread a small piece of pipe, I improvised one from a pipe plier and an ordinary vise. The pipe was held in the plier and the plier handles clamped in the vise firmly. This method worked very well, especially with small pipe.—Abel Greenstein, New York, N. Y.

Building Up Low-Voltage Generators

Overcomes Inexpensively the Failure to Retain a Proper Residual Magnetism

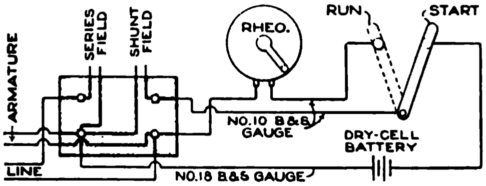
By L. N. Robinson

THE low-voltage, compound-wound, direct-current generators, employed on electromagnetically operated pipe organs, refused to build up to normal voltage with a permanent setting of the shunt-field rheostat. The solution of the trouble is outlined in this article for application to similar difficulties. The trouble was observed particularly after the machines had been in service a few years. When a machine had been standing idle for a few days, it was quite often, though not invariably, impossible to obtain normal voltage without varying the setting of the field rheostat, or making other adjustments of the machine. The operators employed a rather questionable method in building the voltage up under such circumstances; namely, short-circuiting the line terminals and thus magnetizing the machine by the current in the series field.

A machine was run intermittently for observation. It was rated 300 watts, at 10 volts, 600 revolutions per minute. The organ, to which the generator was normally applied, would operate satisfactorily within a voltage range of 8 to 12 volts. The generator was located in the basement, and the organ on an upper floor of the building. The organist could not be expected to go downstairs and tinker with the generator if it did not build up before he was ready to play. For the same reason, it was essential that the shunt-field rheostat be set to give the desired voltage, and that no adjustment of the rheostat be required in starting.

Ordinarily, sufficient residual magnetism was retained so that the generator produced .3 volt without excitation. The machine would build up satisfactorily with the ordinary setting of the field rheostat when the shunt-field circuit was closed with this .3-volt residual armature voltage. At normal voltage, the shunt field required approximately five amperes' exciting current.

Sometimes, after the generator had been standing idle a few days, there was sufficient residual magnetism to induce only .1 volt in the armature. When the shunt-field circuit was closed with this .1 volt impressed through the ordinary setting of the field rheostat, there was not sufficient field current to start the machine building up. This loss of residual magnetism was undoubtedly due to the iron being too soft, or of inferior quality. Obviously, it would be quite expensive to take the machine apart and to replace, or harden, the iron. Also, it would incur a considerable loss to ship the machine to the factory and to trade it in for a new and supposedly better one.



The Diagram Shows the Wiring and Connections for the Building-Up Arrangement

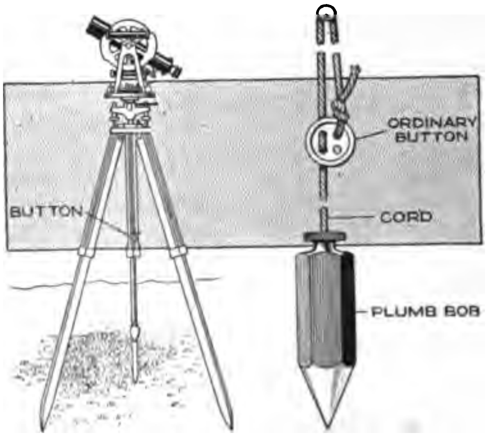
The question then was to make it operate as it should at small additional expense and with as few added complications as possible, because of the inexperience of the person who was regularly called upon to operate it. It was seen from the saturation curve that separate excitation of two amperes' field current would produce a generator terminal voltage of aproximately five volts, which was too small to operate the organ, but sufficient to magnetize the iron. Then, if the connections were immediately changed to give shunt excitation, magnetism sufficient to start the building up of the generator would be retained.

This was accomplished by the use of a dry-cell battery and a little additional wire, by locating a single-pole, double-throw switch, as shown in the diagram, at the keyboard, so that the organist, by operating the switch before beginning to play, could throw the battery in temporarily and then change over to the shunt excitation. The arrangement is very simple and does not require any particular experience to operate. The battery used in this case was located near the generator in the basement. With the lengths and sizes of wires shown in the diagram, only one cell was required in the battery. More than one cell would be undesirable in this case, because the battery would give excitation enough to build up sufficient voltage to operate the organ. The organist might discover this and operate the organ with the switch in the starting position. This, of course, would consume the battery very rapidly and give frequent cases when the battery would be in such condition that it would not serve its purpose.

The battery must be renewed occasionally, probably once a year. Thus it is seen that the initial cost of the remedy is small, the maintenance cost merely nominal, and that the system gives the desired results.

Coat Button Takes Up Slack in Plumb Line

A handy little kink that will save much time in adjusting the length of line attached to a plumb bob is to provide the line with a button adjuster. An ordinary strong coat button, having four holes, is used. The end of the cord is tied in one of the holes, and the other end is then passed through the supporting eye, or over any other supporting point, and through two of the other holes in the button. The adjustment is made by lifting the plumb bob and sliding the button along the cord.



The Plumb Line is Adjusted Quickly by Sliding the Button along It

Garage Patrons Indicate Service Desired by Cards

In a garage where a large number of trucks and pleasure cars were stored, patrons frequently found that their cars were not given certain attention, such as washing, filling of the gasoline tanks, and the making of minor repairs. This work was to be done overnight, and as many of the customers were transients, a loss resulted to the garage owner. He, therefore, made up a set of metal signs, painted in black and white, and indicating the kind of service desired. These signs were kept near the garage door in a rack. The patrons placed the signs on their machines, and the attendants gave the service desired without further orders. The patrons, employes, and the owner were all better satisfied.—L. E. Turner, Brighton, Massachusetts.

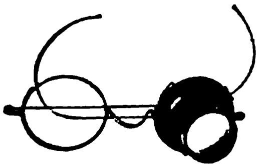
Soldering Joints in Heavy Wire

In soldering large-gauge wire joints, trouble is often experienced in that the solder does not take hold. The flux is usually blamed. By proceeding as follows, good results will usually be obtained: Clean the wire to the required length, and put on the soldering paste. Then dip the ends into the soldering pot slowly, giving them a good tinning. After the wire has cooled off, make the joint in the usual way, and then put a little paste on and solder the joint by holding the ladle as near as possible, pouring the solder over it slowly.—A. Gemmell, Ansonia, Conn.

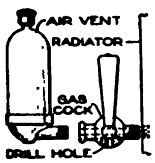
¶In lacing belts, never cross the laces on the side which is to be placed against the pulley, as they will be cut quickly.

Magnifying Eyeglass Fitted into Spectacles

A watchmaker's magnifying glass can be used to advantage for many purposes other than watchmaking, but most persons cannot hold the glass over the eye with convenience. The photograph shows a holder which is used like a pair of spectacles. To make it, the lenses were removed from a cheap pair of spectacles, by crushing the glass with a hammer. The rims then were made circular, to approximately the same diameter as the rim of the eyeglass. A strip of tin, 5/16 in. wide, was cut into small sections and bent at right angles 1/16 in. from one end of each. These angles were soldered to the rim of the spectacles, as shown. The eyeglass was then fastened on the rim by bending the tin strips over the edge. The tin was painted black to match the eyeglass.—Alpha C. Johnson, Washington, D. C.



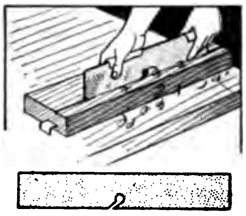
Valve Frees Steam Radiator of Air Quickly



Having steam radiators of the one-pipe system, I found difficulty, after opening up the valve, to rid the radiator of cold air without taking off the cap and screw of the air vent. By the method shown, I not only do away with this trouble, but also save coal, as I can close the stove damper sooner. The device was made as follows: Take a gas cock from an old gas stove; drill a small hole down through the center, as indicated. Remove the radiator air vent and connect the gas cock. When the handle is horizontal, the air vent is working, and when it is up, the air can escape through the drill hole.—James G. Evans, Richmond Hill, N. Y.

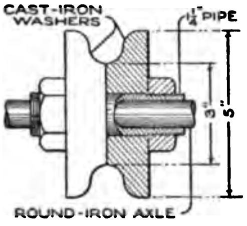
Small Groove Plane Made from Steel Strip

I recently had occasion to plane some grooves, 1/16 in. wide, in a board, and accomplished the work easily by the use of a specially made plane. A piece of cold-rolled steel, 1/16 by 1 by 6 in. long, was rounded at the corners slightly, and then a hole, 5/16 in. in diameter, was drilled 1/4 in. from the edge and near the middle, as shown. A slot was cut to the hole on an angle of 45°. By driving a cold chisel into the slot, the sharp corner was bent out 1/32 in. This edge was sharpened to form a cutting edge. If the tool is to be used for much work, this edge can be casehardened.—U. G. L., Chicago, Ill.



Sheave Made from Iron Washers in Emergency

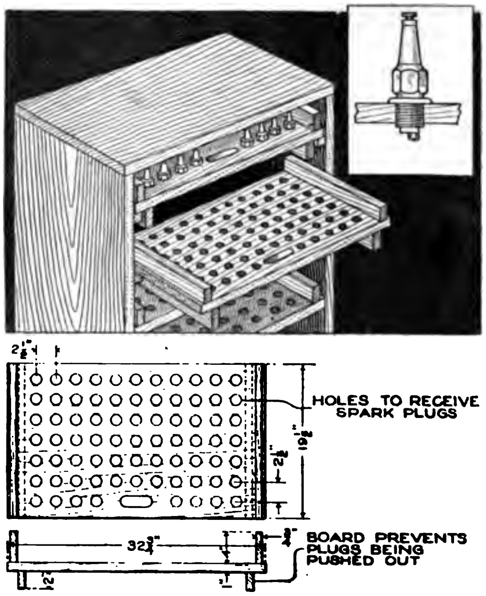
To keep from shutting down on a job where 1-in. rope was to be run over sheaves, it was necessary to make a substitute for these fittings of the usual type, because they could not be obtained within reasonable time. Iron washers, 5 in. in diameter, were used for the purpose, and when fitted together on a bearing, as shown, did the work satisfactorily. The washers were set firmly between nuts on a short section of iron pipe. The bearing axle was fitted inside the pipe and suitably mounted. The sheave gave good service for a long time.—Herman F. Zimmermann, Los Angeles, Calif.



¶Soapy water, applied with a brush over joints in gas or pressure pipes, is convenient in locating leaks.

Stock of Spark Plugs Kept Safely in Racks

Spark plugs are easily injured, especially by the chipping or cracking of the porcelain, when kept loose in a drawer with other material. In the home garage, as well as in the commercial garage or repair shop, racks for the spark plugs will be found useful and economical. Where only a few spark plugs are to be accommodated, a small shelf, or rack, provided with suitable holes to receive the spark plugs, may be used. To care for a larger and more varied stock, a case with special racks, like that shown, is best. The racks are fitted with strips on the upper and lower sides, at the ends, which protect the spark plugs when the racks are set on the bench, or stacked one upon the other.


HOLES TO RECEIVE SPARK PLUGS
32½"
BOARD PREVENTS PLUGS BEING PUSHED OUT

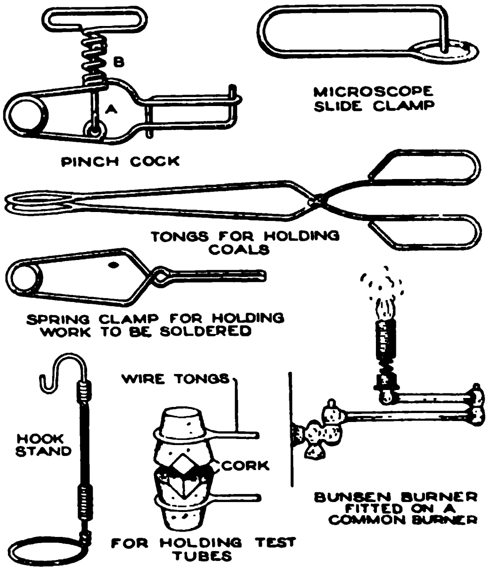
The Spark Plugs are Protected against Damage and Kept in an Orderly Fashion by Providing Racks for Them

Two Handles Used on Small File

In doing some filing with a small rat-tail file, I found it difficult to hold the front end of the file. The job to be filed was in such a position that short strokes were necessary. By fitting another small handle over the front end of the file, I found I could hold it securely and file more accurately. This method is handy in many other forms of filing, even where there is plenty of room.—Lee M. Delzell, Maroa, Ill.

Wire Tools for Laboratory and Workshop Homemade

If a little inventive skill is applied, the worker in the laboratory or small shop can save much time, and expense for the purchase of small equipment, by having on hand a supply of stiff wire and tools for bending it to meet special needs. The several examples of useful tools and implements shown herewith were quickly devised in the laboratory as needed, and will suggest many others. The pinch cock was made of two pieces of wire, A and B, twisted to give a spring pressure on the jaws. The uses of most of the tools are evident. The hook stand can be used in suspending thermometers and other instruments. The tongs with the cork jaws are especially handy for holding hot test tubes. The Bunsen burner, twisted from a piece of wire, is quickly made and practical.—George L. Yaste, Lonaconing, Md.

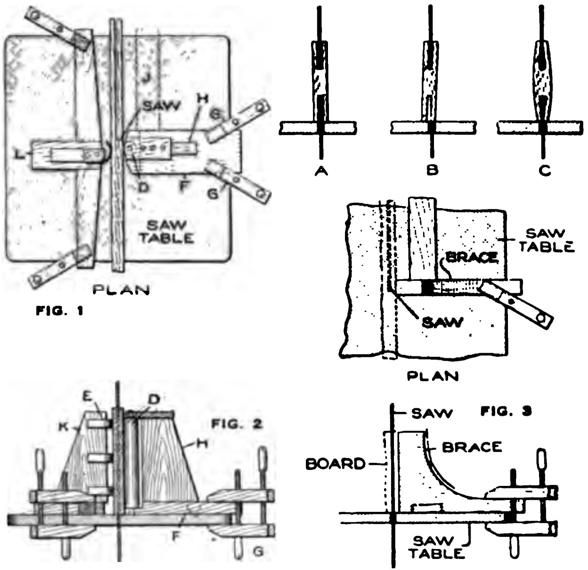


These Practical Tools for the Laboratory or Workshop were Quickly Made as Needed from Stiff Wire

A Resawing Device for the Band Saw

By CHARLES A. KING

IN woodworking shops, equipped with light machinery, there are times when heavier machinery can be used to good advantage; a job of resawing, for instance, makes heavy demands upon a light band saw, but there is so little of such work to be done that it would not be wise to provide expensive equipment for it. The usual method then is to resaw boards up to 8 in. wide on a circular-saw table, by making a cut from each edge of the board, and for boards wider than this the saw cut is made from each edge, and the band saw run through the cuts to finish the job, as at A. This method is often unsatisfactory, as indicated at B and C. These troubles may be overcome by making a simple guide, as shown in Fig. 3, for light work, or as detailed in Figs. 1 and 2, for heavier work.



The Guide for the Lumber being Resawed is Clamped to the Saw Table, as Shown in Figs. 1 and 2, and the Boards are Fed between the Roller D and the Springs E

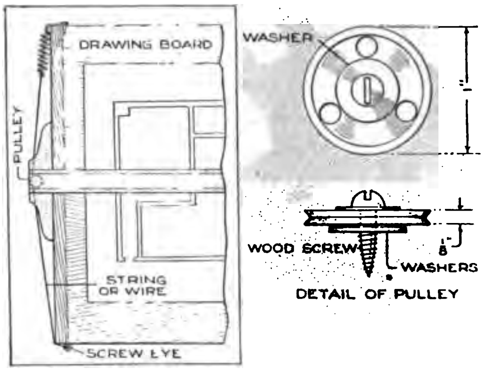
In this device, the operator can control any ordinary deviation of the saw by swinging the board to the right or left, and can regulate the speed of the feed. The essential elements of the device are the roll D, and the springs E, Figs. 1 and 2. The face of the board being resawed should run against the roll, contact being maintained by pressure from springs E. The roll is supported by a frame. The base F is of hard wood, 1¾ in. thick and 6 in. wide, and long enough to permit the hand screws G to hold it firmly at the edge of the table. The brace H is placed well to the back edge of F, as shown, to permit the front hand screw greater leverage. The roll is of hard wood, 2 in. in diameter. The piece J, indicated by dotted lines, may be fastened to the table by a hand screw, and prevents F from pushing back. The brace H is fastened to the base by screws through the latter.

The spring block K is of hard wood. The springs E are made of an old band saw, and are fastened by screws. Piece L is halved and screwed into the bottom piece, which is 1¾ by 4 in. at the middle.

In adjusting the device, care must be used that the bearing of the roll against the side of the board is at the cutting edge of the saw, as seen in Fig. 1. The springs bear ¼ in. or less ahead of the roll. The roll is adjusted to suit the thickness of the stock, by moving the entire frame. Slight changes in the relative positions of the roll, the springs, and the saw may be made by either tilting the table, adjusting the upper or lower guide laterally, shimming with paper or pasteboard, or by adjusting the saw wheels.

Attachment Keeps T-Square Rigid on Board

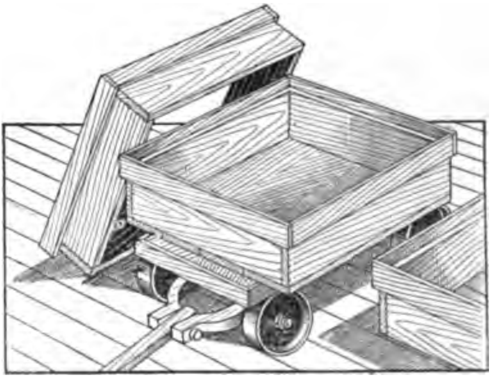
Many draftsmen prefer the common type of T-square because of its wide range of use and the ease with which it can be removed from the board and used as a straightedge. A simple attachment that does not lessen these a vantages of the T-square, and adds even more convenience to its use, is shown in the sketch. A small pulley, as detailed, is fastened to the lower side of the head. A strong cord is fixed to the end of the board, as indicated, and held taut against the pulley by a coiled spring. Thus the head of the square is held firmly against the guiding edge.—J. E. Cahill, Jr., New York City.



The Spring-and-Cord Arrangement Holds the Head of the T-Square against the Guiding Edge of the Drawing Board

Bins Built in Sections Provide for Increase in Capacity

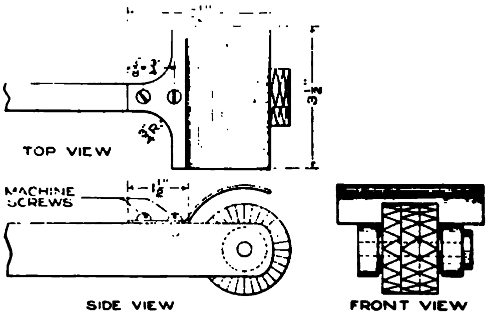
A bin that may be increased or decreased in capacity has advantages over the fixed-volume type generally found in shops and factories. It is especially advantageous for hand-truck factory transportation, since the trucker may add or remove sections as the load to be carried demands. The first-section, or foundation, bin has a bottom; the others are without bottom. A ledge, formed by nailing on a border of strips so that their edges project above the top of the bin, is put on each section, as shown. The lower part of the added section may be fitted into the top of the section below, thus building up the bin to the height desired.



Bins That can be Built Up in Sections Are Especially Useful for Shop Trucks

Guard for Emery-Wheel Dresser

In truing up emery wheels, as is frequently necessary in large shops, considerable danger may be occasioned during this operation if the emery-wheel dresser is not properly guarded. The small sparks and chips may injure the workman's eyes. A good safety measure is to fit the dresser with a guard made of sheet metal and fastened as shown in the illustration.—K. L. J., Pittsburgh, Pa.



The Guard does Not Interfere with the Work and Protects the Workman

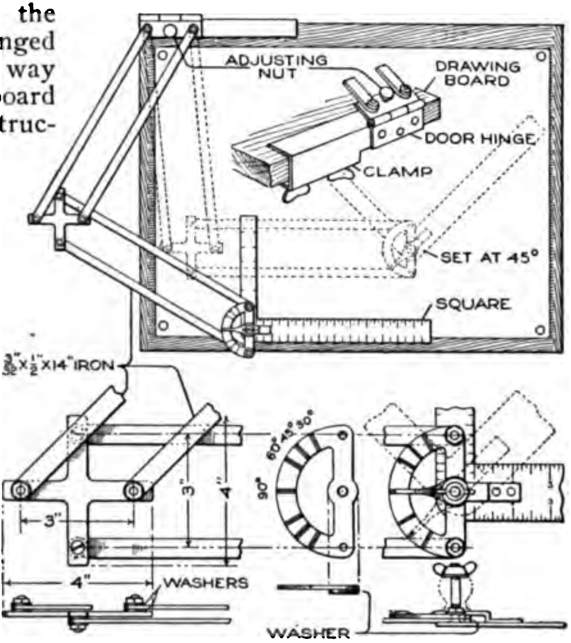
Carburetor Improved by Air-Check Valve Repair

Many carburetors contain an air check, in the shape of a mushroom, which slides on a spindle. With use the hole in the mushroom part becomes enlarged, and the resulting crooked travel of the valve, with consequent air leakage around the hole, makes the mixture imperfect. If the carburetor is adjusted for high speed and heavy loads, the engine runs irregularly when throttled down. Providing a bushing for this valve, or replacing it, usually makes the engine run more smoothly.

A Homemade Mechanical Drafting Machine

The draftsman who is also a fair mechanic will find it worth while to make a drafting machine like that shown, as it is inexpensive and takes the place of most of the common measuring and ruling tools. It is clamped on the edge of the drafting board and hinged so that it can be raised out of the way handily, or removed from the board completely. The details of construction, as indicated, are simple. The parts should be made carefully, however, to insure precise work with this instrument.

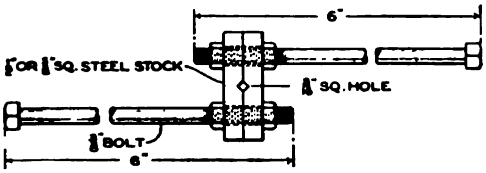
The clamping arrangement is formed of a piece of sheet metal into which two thumbscrews are set. A door hinge is riveted to one end of the clamp, as shown, and an adjusting screw is set in the center hole of the hinge. The parallel arms are made of strap iron, fitted together at the cross as detailed. The radial-gauge fixture requires careful work. Make the protractor of sheet metal, as shown, and file the degree indications into it with a three-cornered file. Make the pointer of a strip of sheet spring brass, and rivet it to a light-weight steel, or other suitable, square. File the pointer to a V-edge, and set it to make a firm contact. Fit the pivot of the radial gauge with a wooden knob and wing nut for adjustment, as shown.—P. P. Avery, Garfield, N. J.



If Carefully Made and Polished, This Drafting Machine will Give Good Service and Save Much Time

Tap and Reamer Wrench Quickly Made

A wrench that is useful, especially with taps and reamers, was made quickly of two bolts, fitted with nuts, and two ½ by ½ by 2½-in. pieces of steel. The square stock was drilled for the

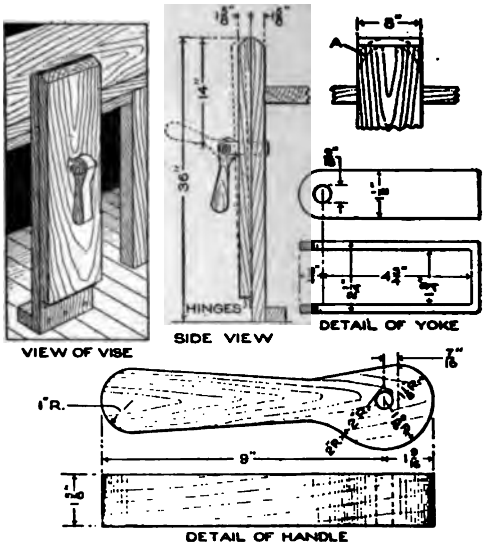


While This Wrench Is So Simple That It can be Quickly Made for Emergency Use, It Is Also Practical as a Regular Tool

bolts and filed to fit the square shank of the tap, or reamer. The bolts serve as handles, and the jaws can be adjusted to various sizes of small, square shanks. If desired, both handles can be set on one side for convenient use in close quarters.

Vise for Filing Hand and Circular Saws

It will pay the mechanic who has saws to file now and then to provide himself with a vise suitable for this purpose, and which can be made easily in the small workshop. The vise also has many other uses where thin wood or metal is to be handled. For ordinary handsaws the vise is shaped as shown in the assembly view, and for use with circular saws, a good plan is to round off and bevel the top edge of the front jaw, as shown in detail, at A. A bolt is passed through the jaws for the center hole of the circular saw.

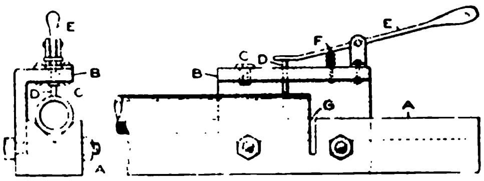


The Saw is Clamped Firmly between the Jaws of the Vise, Which can be Released Quickly by Means of the Cam Handle

The details of construction, as indicated, require a yoke of strap iron. The handle, one end of which is a cam by which the front jaw is clamped firmly at the yoke, should be made carefully to the measurements given. Hard wood is preferable, especially for the handle.

Jig for Drilling Holes in Pipe

This jig was designed for drilling holes in small pipes and tubes. The specific job required that the first hole be a certain distance from the end, and the other holes spaced uniformly in a straight line. The main part, A, of the jig has a V-groove along its length in which the pipe rests. On the upright B are mounted the drill bushing C and the locating device. This consists of the plunger D, actuated by the lever E and the spring F. A slot is milled across the body, at G. In using the jig, a snug-fitting strip of metal is placed in this slot as a stop for the first hole. Then the strip is removed. When the first drilled hole comes under the plunger D, the spring forces the plunger into the hole, locating the pipe for the next hole. The lever E is then pushed down, raising the plunger, and the pipe is moved until the plunger drops into the hole just drilled, this process being repeated for each hole.



The Pipe is Set in the Jig and the Holes Spaced by Means of the Lever Device

Mask for Small Negatives Printed on Post Cards

In printing photographic negatives, 1⅝ by 2½ in. in size, on post cards, I find that a special type of mask saves much time and trouble. Instead of trying to print several of the negatives at once, I fit them singly into the corner of a mask, which is rectangular in shape and as large as four of the small negatives, one-fourth of the rectangle being cut away. The mask is shifted to expose the four negatives in turn, one at a time. A desirable feature is that the light and dense negatives may be timed properly.—Fred Kuhlmann, Peru, Neb.

Casters on Water Barrels Promote Fire Protection

Large barrels, kept filled with water, are often placed at various points in shops or factories for fire protection. If a fire breaks out some distance from the barrel, it is necessary to carry the water in buckets, and much valuable time is lost. It is a good plan to put four large casters on a wooden frame fastened to the bottom of the barrel. In case of an emergency the several barrels of water in the shop may then be pushed to the fire without trouble or delay.—K. M. Coggeshall, Webster Groves, Mo.

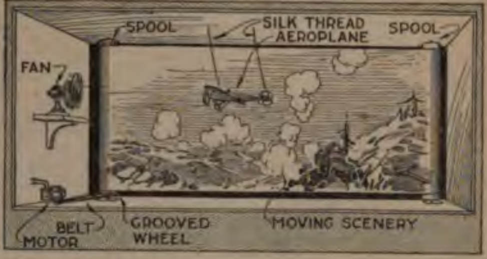
Shop Notes

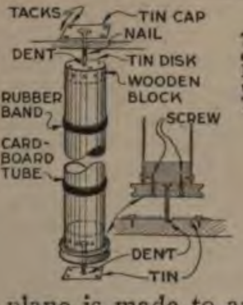
Air Scouting over Battle Fields in a Display Window

By LLOYD WORSWICK

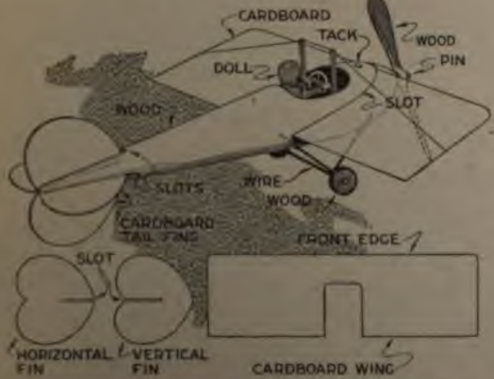
An air scout on a perilous flight in search of the enemy's concealed batteries is seen braving death as he skims above the trenches in the show window of an enterprising merchant. The interest of the passer-by is gained, and he becomes curious to know how the effect is produced. The landscape, apparently moving by under the airplane, is a painted strip of muslin, a yard or more wide and about twice the length of the surface exposed as landscape. Oil colors or wax crayons can be used in making the picture, on the full length of the screen, which is set up as a continuous band moving around on the spools at the ends. The spools are wooden rods or cardboard tubes, fitted with end pivots and set up in suitable supports, the lower ends resting on tin bearings, and the upper ends mounted similarly, from the ceiling or other support.

The construction of the spools is shown in the detail sketch. Rubber bands are placed at intervals around the spools, and grip the muslin band, causing it to move around the spools like a belt. A grooved pulley is fastened to the lower end of the spool and this is belted to a small motor. The airplane is made to appear as if in flight by means of a draft directed in front of it from a fan suitably supported, as shown. The plane is supported by silk threads.





The Airplane in Flight over Ever-Changing Battle Fields Attracts the Passers-By and They Stop to Learn the Secret of the Effect

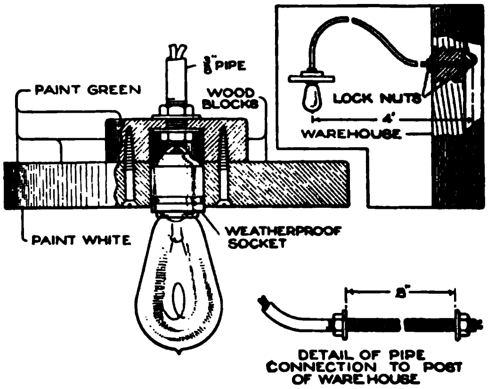


The Model War Plane Is an Interesting Construction, and Easily Built, Largely of Wood and Cardboard

The construction of the airplane is simple and interesting, as detailed in the sketch. It may be made in various sizes, 16 in. long being suitable. The pilot is a doll, preferably of some light material, and covered with brown paper or cloth. The plane is painted a "war gray," and is fastened together securely, as shown. The propeller is made of wood and is set in place on a bead-head pin. The wheels are wooden buttons, supported on wires. The electric fan is placed directly in a lin with the airplane so that the current of air will revolve the propeller, without blowing the machine to one side.

Weatherproof Gooseneck Light Fixture Cheaply Made

Practical and inexpensive light fixtures were required along the outside of a warehouse, and as no roof protection was afforded, the sockets and fittings had to be made weatherproof. Conduits of the gooseneck type were used to support the light, as shown. The straight end of the gooseneck was threaded and fitted with nuts and washers, by means of which the fixture was fastened to the supporting posts of the wall. The wires were carried in the conduit, and the fixture end of the latter was arranged as detailed, providing a weatherproof covering for the socket. Nuts with washers clamp the upper block, as shown, and the lower reflector is fastened with screws. The reflecting surface is painted white and the other parts green. The wires above the socket were taped carefully.—S. Frank Bill, Berkley, Va.



Inexpensive Weatherproof Light Fixtures Were Homemade as Detailed

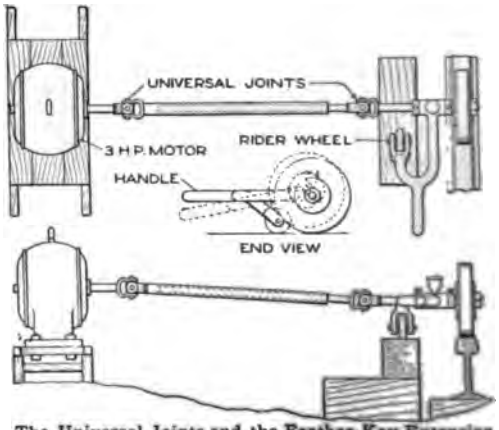
---

Ink Preliminary Sketches Prove Economical and Convenient

In making preliminary sketches, most of which were traced directly by a tracer or draftsman, it was found economical of time, and convenient as well, to make the sketches with ordinary writing ink instead of pencil. The writing ink was preferred also over India, or special drawing, ink because, by using a German-silver ruling pen, the designer was able to lay aside the filled pen now and then, instead of wiping it immediately, as is desirable with the usual pen and drafting ink. The time of the tracer was saved, and errors minimized by furnishing him with clean-cut sketches.

Motor-Driven Grinder for Rail Joints

The arrangement shown was devised for leveling joints in railway tracks, and is useful, also, for other forms of grinding. The power is taken from the trolley wire. The universal joints permit shifting of the motor without blocking it up to a level. The sleeve and extension shaft, joined with a feather key, permit the setting of the motor within a wider range. This feature is also desirable for grinding a wide area without moving the motor. After the rig is set up, the workman bears down on the handle, raising the emery wheel. The current is then turned on, and he lets the wheel rest on the rail. When a car is passing, one workman throws out the switch on the motor and takes the trolley from the wire, while another runs the emery wheel out of the way on the rider wheel.—Bert
Seattle, Wash.



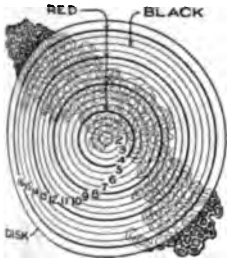
The Universal Joints and the Feather-Key Extension Shaft Permit Satisfactory Operation under Varying Conditions

Soap Used in Bag Improves Auto Washing

A local garage owner cut down his soap bills considerably by a simple method. Instead of throwing the soap loosely into a bucket when washing cars, the washer puts the soap into a small flour bag, ties the top tightly and then places the bag of soap in the bucket of water. Soap left in the bag is used on another job. The old method never left any soap. A barrel of soap lasts one-third longer now than it did before using the bags, and the work is better, for when the water gets soapy enough the bag is taken out of the water.—L. E. Turner, Brighton, Mass.

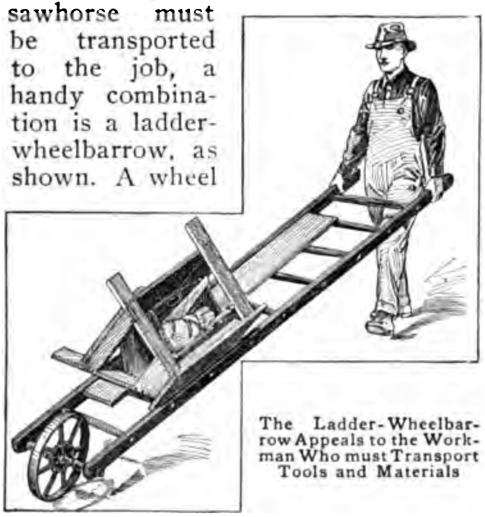
Celluloid Fillet Indicator Handy for Draftsmen

Draftsmen who have had occasion to work on drawings requiring a large amount of corner filleting realize what a job it is to place the fillets accurately. To obviate a great deal of this, I cut a circular piece of thin celluloid, about 2½ in. in diameter, and sandpapered it on one side to a dull finish with a very fine grade of sandpaper. I then made a small hole in the center, and, on the dull side, scribed a number of concentric circles varying $1/16$ in. in radius. The circles of radii of ¼ in., ½ in., ¾ in., etc., were drawn in red to facilitate reading; the rest, in black India ink. The radii of all circles in sixteenths of inches were placed on the celluloid. In use, the circle of the given radius is placed tangent to the two lines where the fillet is required; the center is marked with the point of the compass, and the celluloid removed. Using this center, the fillet is drawn accurately.—Kenneth E. Ernst, New York, N. Y.



Ladder with Wheelbarrow Fixture for Repair Work

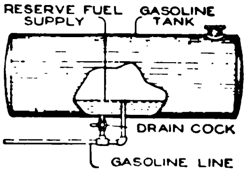
In making repairs on buildings and other structures, where many tools and, perhaps, a sawhorse must be transported to the job, a handy combination is a ladder-wheelbarrow, as shown. A wheel and axle from an old wheelbarrow are fitted to the upper end of a ladder used for repair work and painting. The tools and materials are packed on the ladder, which is wheeled in the usual manner.—A. M. Fairfield, St. Marys, Kansas.



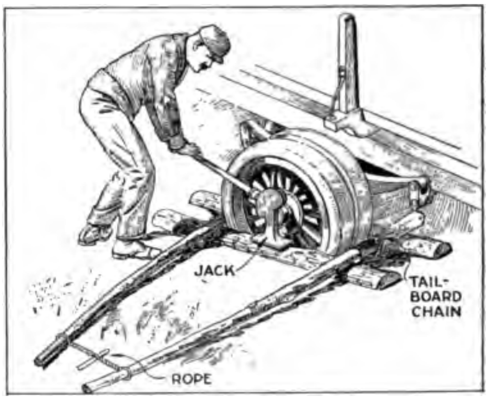
The Ladder-Wheelbarrow Appeals to the Workman Who must Transport Tools and Materials

Special Outlet on Gasoline Tank Provides Reserve Supply

By installing a fitting into the gasoline tank on my automobile I avoid the unpleasantness of suddenly finding myself on the road without a sufficient supply of gasoline to make the supply station, at least. A special outlet was fitted into the tank so that ordinarily the gasoline is not drained to the bottom of the tank, leaving a reserve supply. In an emergency the tank is drained completely by the use of the extra valve at the bottom.—John Edwin Hogg, Alhambra, Calif.



Makeshift Method of Lifting Auto Truck Out of Rut



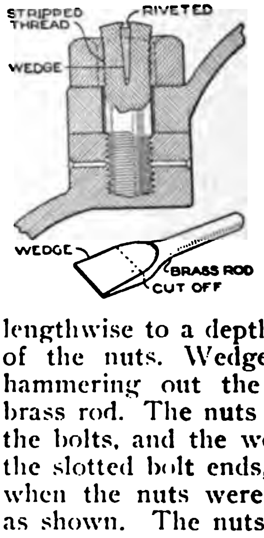
Wheel of Auto Truck Lifted Out of Deep Rut with This Makeshift Rigging

A heavy auto truck became mired in a deep rut on a country road, and the driver, without assistance and with only the auto jack available, was forced to devise some means of getting his machine again under way. The method employed was so simple and effective that it may be of interest to most motorists. Two saplings were set across slabs of wood, laid on either side of the truck wheel, as shown. The tailboard chain was rigged between the saplings just inside of the wheel. A tourniquet of rope was made with a small stick, and fastened to the free ends of the saplings. The jack was set under the rim of the wheel, and, as the latter was lifted, the tourniquet and the tailboard chains were drawn up to bring the saplings close against the wheel. By this means the wheel was gradually lifted out of the rut, and extra slabs placed under it so that the truck was then easily driven to solid ground. Slabs were also piled under the axle as a precaution, in case the wheel should slip back into the rut. —Edwin L. Purkess, Quincy, Mass.

Making Porous Battery Cups

Certain fluid batteries of the Bunsen or Daniell types require porous cups to separate the solutions used in making them. A good porous cup for this purpose can be made at small expense as follows: From heavy wrapping paper make a roll, the interior diameter of which is the outside diameter of the desired cup, and hold the roll in shape with string. Brush the inside of the roll with melted paraffin. Next mix plaster of Paris and water to a thick paste, set the roll up on a flat paraffined board, and pour sufficient plaster in to form the bottom of the cup, about 3/8 in. thick. While this is drying, cut a round piece of wood the size of the inside of the cup. When the bottom has dried, set the wooden piece inside the roll, and pour in the plaster. When set, remove the wooden piece and the outer roll. Cups of various sizes and shapes may be made by this method.—Thomas W. Benson, Philadelphia, Pa.

Nut Wedged on Stripped Bolt in Emergency



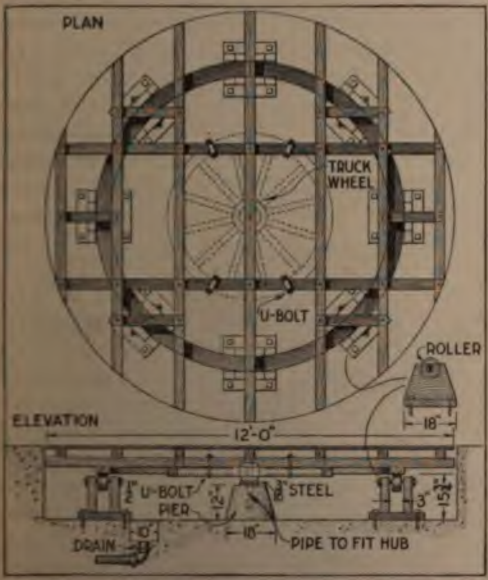
The threads of several stud bolts in the crank case of a stationary gasoline engine were stripped accidentally. Similar bolts could not easily be procured, and the following method was used to retain the nuts in place, as a quick repair: With a hacksaw, the ends of the bolts were split lengthwise to a depth of the thickness of the nuts. Wedges were made by hammering out the ends of a round brass rod. The nuts were placed over the bolts, and the wedges driven into the slotted bolt ends, expanding them when the nuts were forced up tight, as shown. The nuts were alternately screwed up and wedges driven in, until a snug fit was obtained. With the nuts finally in place, the ends of the bolts were riveted over the wedges to prevent them from loosening. To remove the nuts, it was necessary to drive out the wedges from the side.—G. A. Luers, Washington, D. C.

A Turntable for the Small Garage

By JOHN E. CAHILL, Jr.

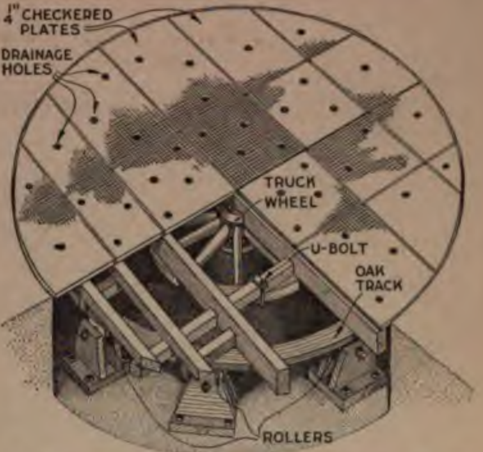
THE advantages of a turntable, especially for the small garage where space is quite limited, are apparent to many automobile owners, but the expense of installing one is usually considered prohibitive. Under these circumstances, the turntable shown in the illustration was designed, and proved comparatively easy to build and thoroughly satisfactory. The turntable was designed to be housed in the garage, and was built in a pit provided in the concrete floor. It may also be built in the open, or protected by a roof. Such a turntable in the garage is very convenient in washing the car, in making repairs, and in taking down the various parts, especially if used in connection with suitable overhead rigging for differential, or other heavy-duty pulleys and tackle.

The details of construction are shown in the plan and elevation views.



This Turntable for the Small Garage was Designed to be Built at a Minimum Cost, and Yet Provide a Substantial Construction

The general arrangement of the parts is shown in the sectional perspective view. The floor pit is built of concrete, 2 ft. deep and 12 ft. in diameter. It is fitted with a drainage pipe and outlet. A heavy truck wheel provides a center bearing, and is mounted over a pipe, imbedded in a concrete base.



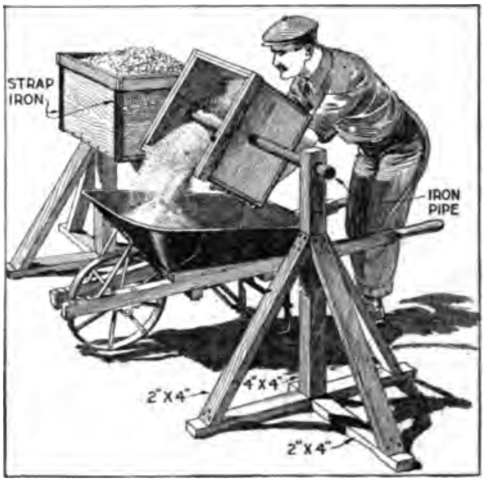
The Framework is Built of Heavy Timber and the Turntable is Carried on Rollers, Bearing against a Wooden Track

Steel washers, 3/16 in. thick, are set between the foundation and wheel, as bearings. The framework supported on the truck wheel is built up largely of 4 by 4-in. timber, with three 4 by 8-in. pieces, arranged as shown in the plan and bolted at the joints. U-bolts of ½-in. round iron, with clamping plates, fasten the main frame to the truck wheel. An oak track of 1½ by 6-in. timber extends around the lower edge of the framework. The curve for this track is struck with a radius of 4 ft. 6 in. for the inner edge, and the segments are one-eighth of the circumference in length, approximately 4 ft. 8 in., allowing for trimming. This track bears on eight roller bearings, mounted on supports, as shown in the sketch, and detailed in the elevation. The rollers are 3 in. thick and 6 in. in diameter, of cast iron, and mounted on steel shafts, 11/16 in. in diameter, with cotter pins at the ends. The wooden supports are of 3-in. stock, and carry ¾-in. pipe for bushings. The supports are bolted into the concrete.

The framework of the turntable, as originally designed and built, was covered with ¼-in. checkered-surface plates of sheet iron, drilled with drainage holes. The plates were set to match on the 4-in. timbers, and fastened at opposite corners with screws, for easy removal in getting at the inner parts of the turntable. The floor may be made also of wood, arranged to be lifted in sections, when desired.

Tip Boxes Measure Concrete Materials Economically

In the mixing of concrete, the materials should be measured accurately if the best results are to be obtained. Sometimes the wheelbarrow, in which the materials are carried to the mixer, is used for a measure. To insure accuracy in measuring the materials and also a minimum of wasted time, the tip measuring boxes shown in the sketch were made. The boxes are made with the desired cubic capacity, and hung, above the center, on a 1½-in. iron-pipe axle. The boxes should be hung high enough to permit a wheelbarrow to be pushed under the bottom without interference. The supports are made of 2 by 4 and 4 by 4-in. pieces, strongly braced. The outfit may be dismantled quickly, and reassembled at another location, and the parts are of handy size for loading on a vehicle. In use, the shovelers fill the boxes, and the barrow men wheel their barrows under the boxes, which are promptly dumped. They are then filled again, ready for the return of the barrows.



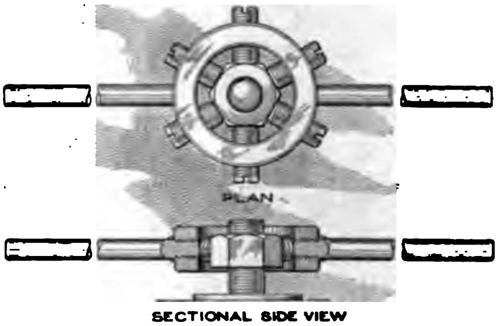
The Measuring Boxes are Used in Batteries to Make Up a Properly Proportioned Batch at a Time

Several boxes are usually desirable. For example, if a concrete of one part cement, two sand, and four stone is to be mixed, and each batch comprises 10½ cu. ft. of dry material, there should be six tip boxes: one 1½-cu. ft. box for cement, two 1½-cu-ft. boxes for sand, and three 2-cu.-ft. boxes for stone.

For each batch, the routine procedure of filling the battery of boxes, dumping their contents, and wheeling the material to the mixing trough is so simple that mistakes in proportioning the materials are not likely to occur.—Richard L. Nourse, Duluth, Minn.

A Novel Adjustable Wrench

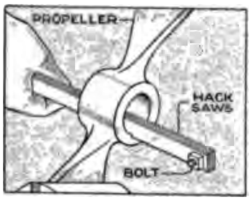
A type of homemade wrench, which has a wide range of adjustment by means of screws set in a ring, as shown, was made as a novelty, and proved quite useful. Three of the screws can be used at a time for handling one size of hexagonal nut, and the others adjusted for another size. Two opposite screws will grip a square nut, and an octagonal nut can also be held tightly. The screws are loose enough so that they can be turned with the fingers, and are set when necessary with a screwdriver. In this way the wrench can be clamped to the nut.—J. Prophet, Pittsfield, Mass.



This Wrench, Made as a Novelty, Proved Quite Useful

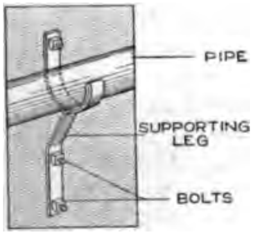
¶Sheet brass should be inclosed in a large wrought-iron pipe, closed at one end, when being annealed.

Keyway Cut in Bearing with Massed Hack Saws



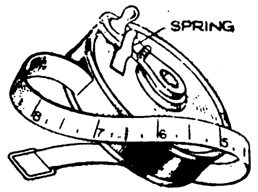
It is often a hard job to cut a keyway through a hollow bearing, even with the necessary tools at hand. Such a problem, and with few tools available, confronted a launch owner when the propeller loosened from its seat on the shaft, making it necessary to cut a new keyway and to reseat the propeller at once. The work was accomplished satisfactorily. Several hack saws were fastened together, with the teeth all extending the same way, and held firmly by means of small bolts through the holes in the ends. Enough blades were assembled to make their thickness a trifle less than the width of the key. The propeller was then held in a vise, and the blades passed through the bearing, as shown, one end of the bunch being grasped in each hand. A new keyway was sawed, and the bottom smoothed out with the edge of a thin file.—Robert L. Binns, Denver, Colorado.

One-Piece Pipe Bracket of Strap Iron



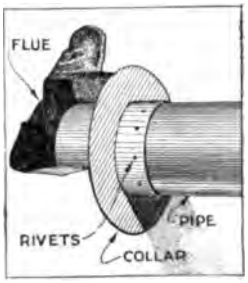
A pipe bracket, for supporting pipe along the sides of buildings, walls, etc., can be made quickly from a single piece of strap iron, as shown in the sketch. It requires no bolts or rivets to make it retain its shape, and may usually be bent cold. Care should be taken to see that the supporting leg is directly under the pipe. The fastening through the supporting structure can be made with bolts or screws.—Roy H. Poston, Flat River, Mo.

Spring Clip Locks Rolled Measuring Tape



The folding handle of a measuring tape had a tendency to unfold when other articles in the tool box came in contact with it, especially after it had been long in use. This caused the tape to unroll and to be in danger of damage when extending from the case. As a remedy, a small spring, shaped as shown, was fastened to the case. The handle is kept unfolded under the clip, which acts as a stop both when the tape is in use on the job, and when it is in the tool box. The clip folds against the case closely, and does not interfere with the winding of the tape by means of the handle.—Elmer O. Tetzlaff, DePere, Wis.

Riveted Stop Collar for Pipe Connection to Flue



Poor draft in the boiler or furnace is often due to a defective flue connection at the smokepipe. The stovepipe is sometimes set into the flue opening without a metal collar being secured to the end of it. The result is that the pipe jams into the flue and cuts off enough of the flue area to choke the draft. If the sheet-metal collar is riveted in place, as shown, it will prevent this slipping of the pipe. The connection to the flue should, of course, be kept down as far below the ceiling joists as practicable, but if it must be made close to them, the pipe should be covered with a suitable insulation.—Harold V. Walsh, Yonkers, New York.

An Electric Operation Recorder with Remote Control

By C. H. HOWARD

THERE are many applications for which an operation, or revolution, recorder, which may be actuated from a distant location, is desirable. The electric recorder, the arrangement of which is shown in Fig. 1, can be built to satisfy most ordinary requirements of this character, and is also simple in construction and operation. One of these recorders can be made easily, assuming that a movement, or gear train, like that shown, from a discarded watt-hour meter is available. Such a recorder may be adapted to count the number of revolutions made by a distant printing press or other similar mechanism; the number of times a door is opened or closed or the number of times a certain machine performs its functions. It may also be adapted so that it will count the number of turns of wire being wound on a spool or magnet.

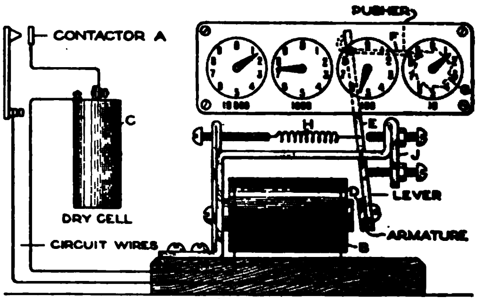


Fig. 1

General Arrangement of the Working Parts: The Recording Action on the Dials is Induced by the Completion of the Electrical Circuit, at Each Motion to be Counted

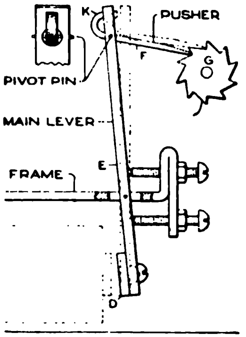
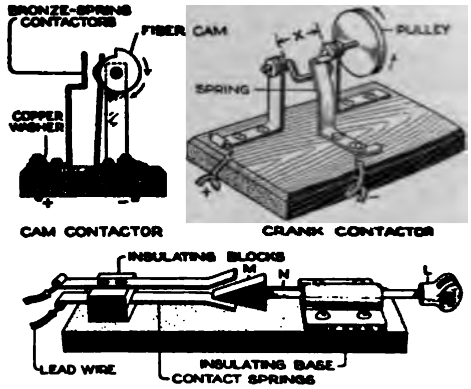


Fig. 2

The contactor A, shown in Fig. 1, is mounted on the device, the operation of which it is desired to record. The counter, with the magnet B and its frame, may be installed at any location within a reasonable distance from A. The circuit wires connect to the contactor and recorder, as shown. Whenever the contactor A is closed, current is circulated by the battery C around through the now closed circuit, thereby energizing the electromagnet B. The magnet draws over the armature D, which then, by means of the lever E and the pusher F, detailed in Fig. 2, thrusts the ratchet wheel G ahead one notch, thus indicating one operation.

The fine wire spring H, the tension of which may be adjusted at the supporting screw, pulls lever E back to its normal position when B is deenergized. Adjusting screws are provided to limit the movement of the lever E. All the parts of the device, with the exception of the magnet core, the armature D, and the frame J, which are of iron, should preferably be of brass. As shown in the detail, in Fig. 2, one end of the pusher F is bent around at K. This bent end forms a stop which prevents F from dropping down if its wedge end happens to be pulled back out of engagement with G.



CAM CONTACTOR

CRANK CONTACTOR

WEDGE CONTACTOR

Fig. 3

Details of Three Contactors for Use in Making the Electrical Contacts in Recording Various Kinds of Operations

Contactors of various types may be designed for different services and locations. Some simple, effective designs are shown in Fig. 3. The cam contactor is mounted on the end of a shaft. Each time the shaft rotates, the fiber cam forces one [illegible] bronze spring into conta [illegible] er, completing the ci

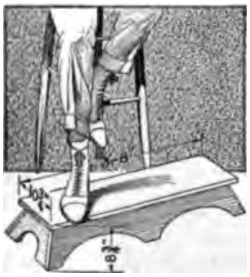
In the crank contactor, detailed in Fig. 3, each time the shaft makes a revolution, it wipes against the leaf contactor spring, and thereby completes the circuit of the recorder. The crank is turned by means of a pulley, which may be driven with a small belt from another shaft. The length of the crank between sides, at X, should be just a trifle less than the distance between the washers soldered on the bearing posts. Thus the longitudinal movement of the shaft will be limited, and no collars on it will be required. The washers soldered to the bearing post prevent the corners of the crank, as it turns, from striking the post. When an oscillating, or reciprocating, motion is to be recorded, a wedge contactor, as shown, may be utilized. The oscillating motion is communicated to the device by a connecting rod pivoting in the head L.

Each time the rod thrusts forward, the metal wedge M makes a wiping contact between the springs mounted above and below it. Insulation is provided by the fiber rod N. Where the service is severe, it is better to use a metal rod for N, with a connecting rod of insulating material, or a metal connecting rod with an insulating joint.

Letters on Machinery Chalked White for Photographing

In photographing machinery for the making of illustrations for catalogs and similar uses, it is usually desirable to have the trade-mark or manufacturer's name show plainly. When the name is cast on the machinery, as is usually the case, a simple method is to chalk the letters carefully so as to make them appear white in the photograph.

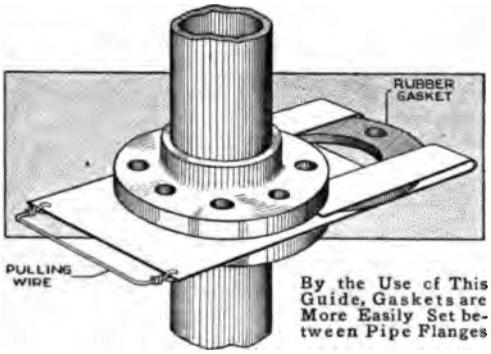
Nontipping Footstool Handy for Draftsmen



A footstool which proved popular with a large staff of draftsmen is shown in the sketch. It was designed with a wide base so that it is difficult to tip it over with the feet. This also avoids the noise of tipping the stool on edge and then dropping it. The wood used was ⅞-in. pine, and the footstools were stained and shellacked. The dimensions shown were found satisfactory, but may be varied for special needs. In making large drawings, the men find this stool especially convenient.

Device for Setting Gaskets in Pipe Joints

Replacing rubber or other gaskets on flanged pipe joints is often a tiresome job. To facilitate this work, I made a tool of light-gauge sheet metal, cut to the shape shown in the sketch and bent to hold the rubber gasket at one end. The projecting ends of the piece of metal are folded back over the gasket, and act as guides in sliding the gasket into place. These strips are sprung sidewise after the gasket has been set with a bolt at the open end of the guide. The latter is then drawn out without disturbing the position of the gasket.—A. J. Cohen, Brooklyn, New York.

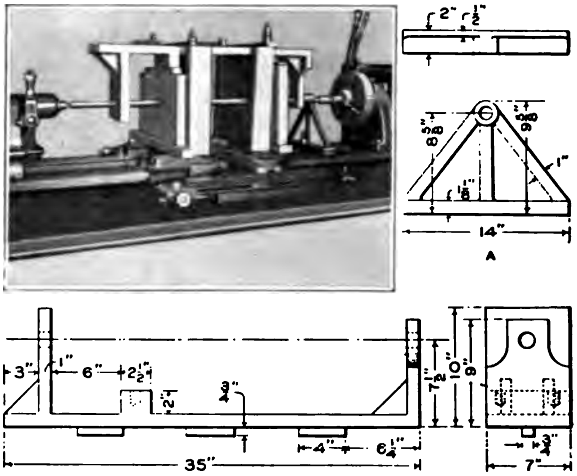


By the Use of This Guide, Gaskets are More Easily Set between Pipe Flanges

¶Glass should not be fitted too closely in a picture frame, to allow for expansion.

Unusual Boring Job Done on a Lathe

An unusual set-up for a piece of machine work, and an illustration of what may be done on a lathe, is shown in the photograph and the sketch. The job to be made is part of a jig, which required that the hole in each end be bored in line and true to size. The only machine available for doing the work was a 16-in. lathe. A guide, A, was made for the boring bar. It was not possible to rest the work directly on the saddle, so it was blocked up and clamped down, as indicated. Two cutters were placed in the boring bar, and the work was finished in a short time. A universal joint was used in the center, so that the movement of the bar would not be irregular, even though it might not line up precisely with the centers.—Harvey Mead, Scranton, Pa.



When Only a Lathe Was Available for a Special Boring Job, This Rigging was Set Up, and Accomplished the Work

Conical Fire Buckets Seldom Misused

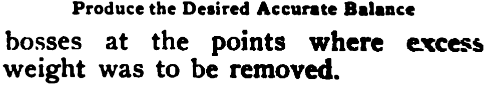
In a large plant where fire protection is essential, various methods of preventing the use of fire buckets for other than their intended service were tried without success. Finally, pails of about the usual capacity and conical in shape, with a sharp point at the bottom, were installed. These proved satisfactory, as the possibility of their misuse for other purposes is limited.

Patching Worn Guides in a Wooden Miter Box

A superior method of closing worn-out cuts in a wooden miter box is to cut thin slices of end grain out of the same dimension stuff as the sides of the miter box, and to glue these into the cuts. Cut these slices in the miter box to a thickness which will permit them to slip easily into the cuts they are meant for. With a piece of tin, apply glue to the inner surfaces of the cut, allow it to soak in, and apply more, using plenty. Slip in the filler and allow it to dry. When the glue is set, a new cut is made within 1/8 in. of the old one, or the new cut can be made to run through the old one at an angle. The life of the miter box can in this manner be lengthened considerably, and the new cuts will give good service if carefully made.—Henry Simon, Laguna Beach, Calif.

Crankshafts Ground to Balance without Weakening Them

In order not to weaken crankshafts by grinding them at certain points so that they balance properly, small rounded knobs, or bosses, were provided on the shaft, as shown in the illustration. The crankshafts could thus be easily balanced by grinding the bosses at the points where excess weight was to be removed.

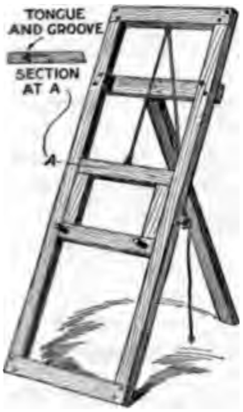


The Small Bosses on the Crankshafts Make It Convenient to Grind Off Excess Metal to Produce the Desired Accurate Balance

Hacksaws Do Better Work When Properly Selected

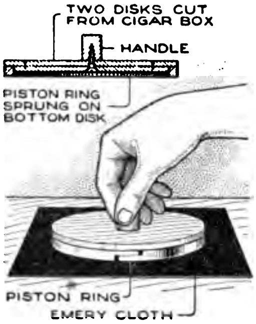
Hacksaw blades do smoother work and wear longer if oiled, and especially if a saw of the proper type is selected for the work in hand. Proper hacksaw practice is quite commonly neglected in machine and repair shops where hurry-up jobs are always in order. Considerable time can be saved, and better work turned out, by keeping frames fitted with 14, 18, 24, and 32-tooth blades in the tool room, instead of providing only coarse blades.

A Painter's Folding Easel Made of Flooring



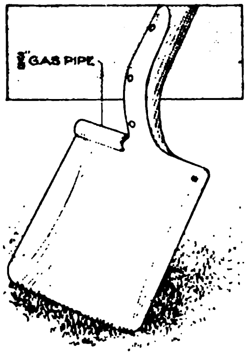
A painter's and showcard writer's easel, substantial and practical, can be made from tongue-and-groove flooring. Saw the strips of flooring in halves, lengthwise, and make the large frame of the grooved pieces. If narrow flooring is used, it need not be ripped, the tongue being cut off the strips for the large frame, and the grooves from those for the small one. Make the small frame of the tongue sections, as shown, to fit loosely and slide up and down in the grooves of the large frame. Fasten a screw eye at the top of the large frame, and one in the top of the small frame, and tie a stout cord to the eye in the latter, running it through the eye in the large frame. Nail a strip of wood to the back of the frame, and on this hinge the supporting strip. By pulling on the cord, the small frame is raised and lowered. The canvas, or card, is placed on pegs in the small frame, or a suitable trough may be provided.—E. A. Hoppman, New York, N. Y.

Device for Grinding Oversize Piston Rings by Hand


TWO DISKS CUT FROM CIGAR BOX
HANDLE
PISTON RING SPRUNG ON BOTTOM DISK
PISTON RING
EMERY CLOTH

The automobile owner who frequently tinkers with small repair jobs, as well as the gasoline-engine mechanic, will find this kink in the grinding of oversize piston rings a handy one. The work should be done very carefully, and the method sometimes employed of rubbing the ring on emery cloth, the ring being held with the hand only, is not efficient. The device shown was made of two disks cut from cigar-box wood, and fastened together with a screw set in a small handle. The ring is sprung onto the bottom disk, and is in convenient position for accurate grinding on a sheet of emery cloth laid on a flat, hard surface, preferably a polished metal plate. —G. Brown, Chicago, Ill.

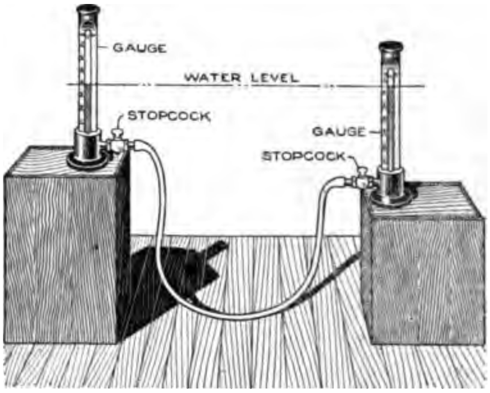
Shoe Guard for a Shovel



A shoe guard for a shovel which will be appreciated especially by the many women gardeners who are practicing war-time economies, can be made by fitting a short length of gas pipe tightly over the upper edges of the spade or shovel. The pipe is cut to the proper length as shown, and then sawed open on one side. By spreading it properly and springing it onto the shovel blade, it will stay in place without special fastening.—Marie C. Moore, Seattle, Washington.

Homemade Water-and-Tube Level Indicator

The homemade instrument shown in the illustration is useful for finding levels at long distances, over obstructions or around corners, and for lining up shafting, etc. It indicates that points are out of level, and also shows in inches how much they are out of level. When leveling two points, a gauge is placed on each, as shown. The stopcocks are opened, and when the water comes to rest, closed again. The apparatus may then be lifted up, and carried to the light, if necessary, and the exact position of the water-column height determined on the scales. About 10 per cent of glycerin added to the water before filling the level will ordinarily prevent it from freezing. If accidentally the stopcocks should be left open, little float valves, located in the cups at the top of the gauges, close the vent holes automatically when the water level rises to them. This avoids the annoyance from overflow of the liquid.



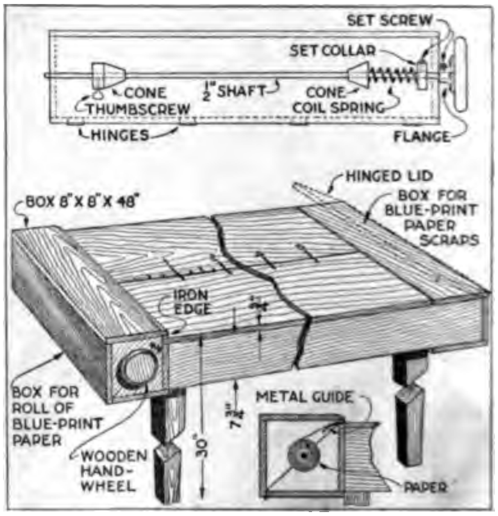
The Glass Gauges are Mounted on Standards Set into Suitable Pipe Flanges and Capped with Metal Fittings

Enlarging Dials on Machine Produces Closer Work

In handling an exceptionally accurate job of tool making on a milling machine, it was found that the usual dials did not give the accuracy required. Dials, 12 in. in diameter, were made, with the same graduations as the corresponding ones on the machine. These were set over the machine dials very carefully, and used in place of them. Suitable indicating fingers were made to fit the dials where needed, and by this means extreme accuracy was obtained. The dials proved so useful that they were preserved for other jobs. The same method can be applied on a number of other high-class shop machines.—Otto S. Anderson, La Vina, Calif.

Case at End of Table for Blueprint or Drafting-Paper Rolls

An arrangement which is useful and economical for the drafting or blueprint room is a table with special cases at the ends to contain the rolls of paper and the pieces trimmed off but still useful. The top of the table is marked off in indications for measuring the length of the sheet, which is torn neatly at the iron edge of the box containing the roll of paper. The roll is supported on an iron shaft having a spring and cone device, as detailed, to hold the roll. A metal guide, as shown in the sectional view below, starts the edge of the roll through the slot, when the handwheel is turned to unwind the roll.



Drafting Papers are Cared For Economically by This Outfit, and the Sheets Cut Neatly and Quickly

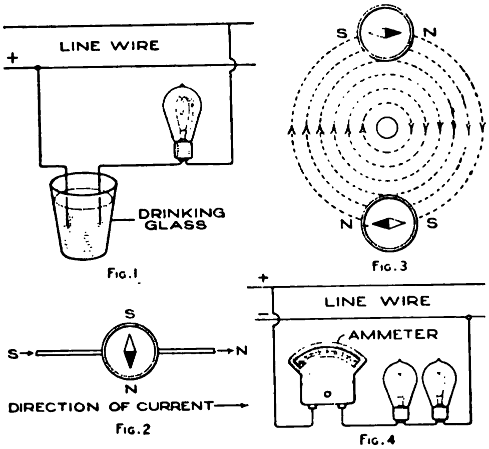
Methods of Testing the Polarity of Line Wires

When installing electrical machinery it is often necessary to locate positive and negative sides of a circuit before a piece of apparatus can be connected. A simple test, for other than high-potential circuits, is shown in Fig. 1, which represents the ends of two wires, one from each side of the circuit, placed about 1 in. apart in a glass of salt water. A suitable resistance, such as one or more lamps, is placed in the circuit. Bubbles arise from each of the terminals. That from which fewer bubbles arise is the positive wire.

The compass test, shown in Fig. 3, is based on the action of the magnetic lines of force, set up around a wire carrying current, upon a magnet placed in the vicinity of the conductor. The conductor is represented perpendicular to the plane of the paper with the current flowing "down," or away from the observer. A compass needle placed in the magnetic field will tend to assume the position shown, its north pole pointing in the direction of the lines of force set up by the current in the conductor.

This test can also be made on a horizontal conductor. Select a part of the wire that is placed, or can be bent, in an approximately north and south direction. Place the compass directly over the conductor, as indicated in Fig. 2. If the current in the conductor is flowing from south to north, the north pole of the compass will be deflected toward the east, and the reverse.

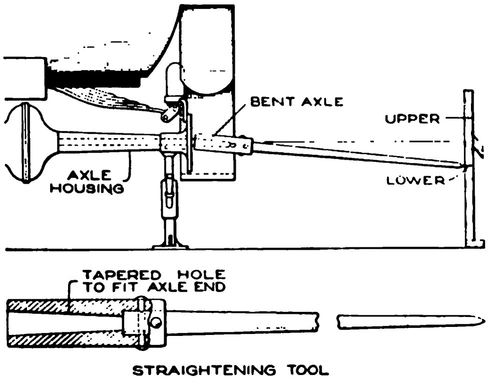
A small reading ammeter in series with a suitable resistance can be used to determine the polarity, as shown in Fig. 4. In order to obtain a proper deflection of the meter needle, the positive ammeter terminal must be connected to the "plus" side of the circuit, and the negative terminal to the "minus" side of the circuit. If the connections are reversed the needle will be deflected in the opposite direction until its further progress is barred by a stop, or by the side of the case. It is well in this test to use enough resistance in series with the ammeter so that the current through the meter will be small. Permitting a large current to flow through the instrument in the reverse direction may harm it by bending the needle.—Peter J. M. Clute, Schenectady, N. Y.



Four Simple Tests to Establish the Polarity of Wires in Electrical Installations

Straightening Bent Automobile Axles

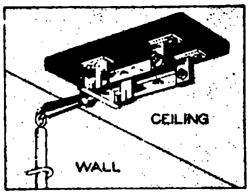
A method of straightening bent automobile axles, used by a local repair shop with the best of results, is shown in the sketch. The straightening tool is 6 ft. long, drilled with a tapered hole to fit over the axle end. A solid bush-



With This Tool, the Work of Straightening the Axle can be Done without Dismantling the Car ing, of the exact size of the roller bearing in which the axle shaft revolves, replaces the roller bearing during the straightening process.

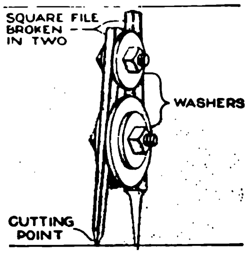
The procedure for straightening is as follows: The axle being jacked up, the straightening bar is slipped over the tapered end of the axle, and held, to prevent it from turning. The axle shaft is revolved by turning the starting crank of the engine with the clutch engaged. An upright board is placed at the extremity of the pointed end of the bar, as shown. The high and low points to which the turning axle moves the pointed end of the bar are marked on the board. The intermediate point of these two positions is measured off, and by pressure on the end of the bar, the axle is sprung back until the pointed end comes to this place. Great care should be taken that the sleeve grips solidly, when the axle is straightened.

Electric Switch Mounted on Ceiling for Safety



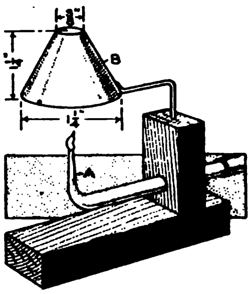
An electric grinder was installed in a 440-volt circuit, and we wanted the switch in a safe place where there would be no danger of anyone accidentally touching it. The switch was, therefore, rigged on the ceiling and a control device was made for it so that the current could be shut off, or turned on, conveniently at the wall. The lever device shown in the sketch has sufficient play for the switch to open and close, and is operated by sliding the vertical bar up or down.—C. Anderson, Worcester, Mass.

Makeshift Tool Cuts Round Holes in Sheet Metal



A hole was to be cut in the metal dash of an automobile, and no cutter of the usual type was at hand. I devised a substitute tool in a few minutes from an old square file, washers, and two bolts. The file was ground to a sharp point at the tang, and to a cutting point at the other end. It was then broken at the middle and the parts clamped together, as shown. The device was used like a compass, and cut a clean hole in the metal.—G. I. Mitchell, Ruston, La.

A Small Blowpipe Torch without Compressed Air



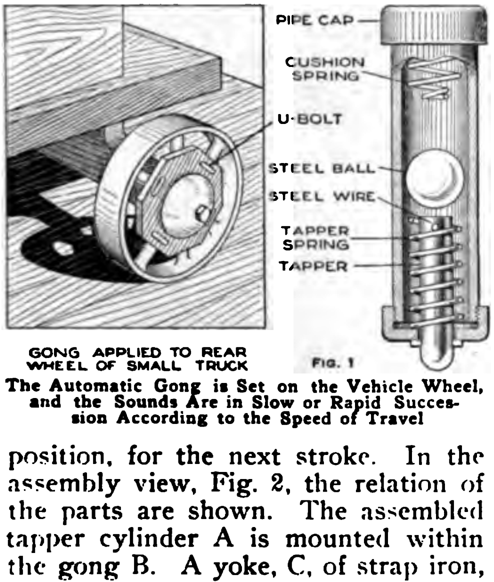
It is often desirable to obtain a higher temperature than the ordinary gas jet or the Bunsen burner will give, where a source of compressed air is unavailable. A simple burner, arranged as a small blast lamp, is shown in the sketch. By its use, such work as glass-blowing and welding may readily be accomplished. The part A is a portion of a common blowpipe, or may be any similar tube with a tiny outlet in the tip. This blowpipe is connected to the gas supply by rubber tubing, and mounted as shown. A conical hood, suitably supported, is placed above the jet, and acts as a mixer and burner. By adjusting the hood, and thus the draft, the flame may be varied from a small hot point, above B, to a broader tip and an intensely hot region just below the mouth of the mixer. The best adjustment can readily be determined by trial. After the funnel becomes hot, it keeps the heat in and cuts off radiation.—R. D. Rusk, Niles, Ohio.

An Automatic Warning Gong for Vehicles

By EARL W. DAVIS

A GONG which will sound its alarm, whenever the vehicle on which it is mounted is in motion, is often desirable. Such a gong is detailed in the illustrations. Advantages of this arrangement are its simplicity, and the fact that it is self-contained. Also, the frequency of the gong strokes is proportional to the speed of the vehicle on which the gong is mounted. Thus, when the vehicle carrying the gong is invisible, the listener can judge of the rapidity of its approach. This is of importance in locations which are dimly lighted, in mines, or in dark corridors in industrial plants. Some of the applications for this automatic alarm are on trucks in factories, on monorail telphers, cranes, mine locomotives and cars, and turntables.

As indicated in Fig. 1, the automatic gong is attached to one of the wheels of the vehicle. As the wheel completes a rotation the gong sounds once. At each rotation the steel ball within the tapper cylinder drops against the tapper, making the latter strike the gong A spring returns the tapper to normal position, for the next stroke. In the assembly view, Fig. 2, the relation of the parts are shown. The assembled tapper cylinder A is mounted within the gong B. A yoke, C, of strap iron, holds the device to the board D, by means of screws. The cap screw E, passing through the hole in the gong and turning into a tapped hole in the yoke, clamps the gong in position. A washer, F, is provided between the yoke and the gong so that the gong lies in the correct location to receive the blows from the tapper. Spacing blocks may be inserted to raise the tapper cylinder from the mounting board. This board, with the device on it, is clamped to the vehicle wheel with U-bolts, as shown in Fig. 1. For severe service, mount the gong on a square steel plate, and bolt this to the wheel.



GONG APPLIED TO REAR WHEEL OF SMALL TRUCK

FIG. 1

The Automatic Gong is Set on the Vehicle Wheel, and the Sounds Are in Slow or Rapid Succession According to the Speed of Travel

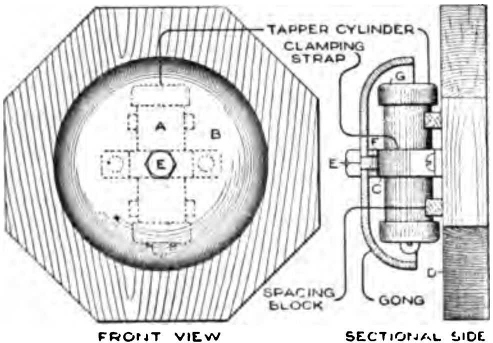


Fig. 2

Details of Construction: The Gong is Mounted on a Board and Houses the Operating Mechanism

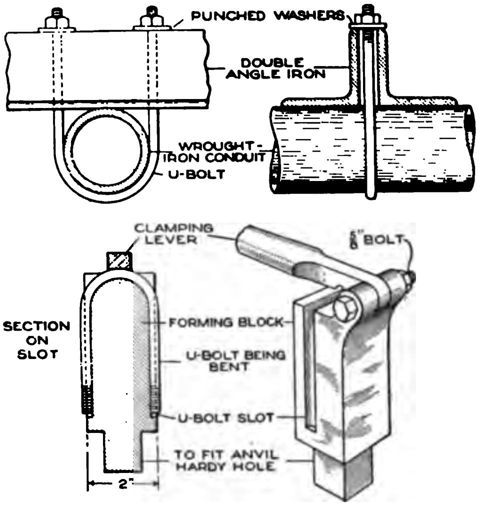
The detailed construction of the tapper cylinder is shown in Fig. 1. A wrought-iron nipple provides the body, which is fitted with malleable iron pipe caps. One of the caps has a hole drilled through it to accommodate the tapper. Two drive-fit steel-wire pins in the tapper act as stops. The ball is of the usual ball-bearing type. If a bearing ball is not available, a rounded piece of iron will serve. The spring is of No. 11 gauge brass wire, for the average case. The spring returns the tapper after the ball has struck, and holds the tapper in position against the centrifugal action. A cushion for the ball on the rebound is provided by the spiral spring, of No. 18 gauge wire. Experimentation may be necessary to adjust the parts to best advantage for individual installations

---

¶Outer corners of machine parts are often rounded slightly because sharp corners become nicked easily.

Practical Uses for U-Bolts and Rig for Forming Them

Round wrought-iron U-bolts can frequently be employed to excellent advantage as clamps, in piping or in conduit-wiring installations in steel-frame buildings, and for many other purposes also. A typical method of using a U-bolt for this service is shown in the illustration. The pipe, or conduit, is clamped to a steel member with a U-bolt, between two mild-steel angles. U-bolts for the smaller-sized tubes can be bent cold and formed around a piece of pipe conduit of the correct diameter. The threads should, of course, be cut on the rod before it is bent.



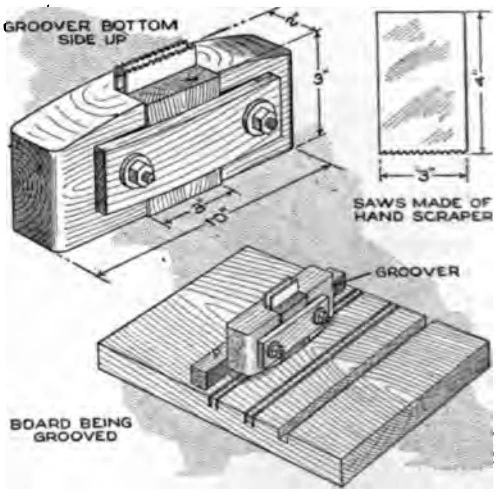
U-Bolts Can be Made Quickly and Uniformly by the Use of This Device

Where U-bolts are required for tubes of larger diameters, it is not practicable to bend them cold. If many U-bolts of the same size are required, particularly in industrial-plant installations, it will pay to construct a bending rig like that shown. This consists of a block of wrought iron in which is cut a groove form. A hinged lever at the top of the block holds the bolt while it is being bent. On the lower end of the block is a square extension, to fit the hardy hole of an anvil.

In using the rig, the wrought-iron rod is heated to a cherry-red, and then held at its middle point in the rig between the lever and the forming block. Pressure on the lever will hold the piece of stock in position. Then, with a wooden, or lead, mallet, the ends of the rod are pounded down to shape.—R. C. Frank, St. Louis, Mo.

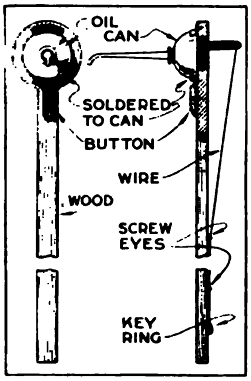
A Rabbeting and Grooving Tool of Wide Use

In getting out a job which required the making of a large number of grooves and rabbets of various sizes, across the grain of the boards, I saved much time by making a simple grooving and rabbeting tool, which was well worth while keeping as a handy device. A piece of hard wood, 2 by 4 by 10 in. long, was shaped as shown in the sketch. The lower edge was curved slightly so that grooves could be cut in somewhat concave surfaces. One side of the block was gained out and fitted with blocks to hold the cutters. These were made of soft steel filed with teeth as detailed. A strip of wood, fastened with screws, clamps the cutters and cutter blocks into place. By providing a set of cutter blocks, the cutters can be set at various standard widths, and, for odd sizes, special blocks can be made



The Saw-Tooth Cutters are Set to the Proper Width and Depth, and a Strip is Used as a Side Guide quickly. The lower sketch shows the tool in operation, one of the grooves being routed out, and the others having the kerfs as cut by the tool.—Herman F. Zimmerman, Los Angeles, California.

Oilcan Mounted on Pole for Oiling Overhead Bearings

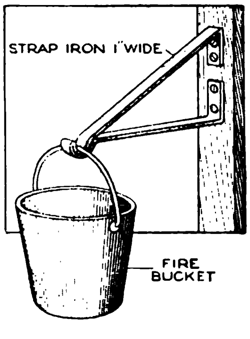


An ordinary long-spout oilcan, with a spring bottom, was mounted on a pole fitted with a device for pressing the bottom, and proved very useful in a shop where many overhead bearings were to be oiled. The arrangement is, of course, not practical for oiling loose pulleys and similar machine parts, but has a wide range of use otherwise. The supporting rod is shaped as shown, and the can is held in place by a metal clip at the top, and a button at the lower end. The button engages a small metal angle soldered to the can. This arrangement makes it easy to remove the can for filling. A metal angle is set in a mortise through the pole at the bottom of the can, and this device, controlled by a wire threaded through screw eyes, acts like the thumb in pressing on the bottom of the can in ordinary use.

Gilding on Bare Wood

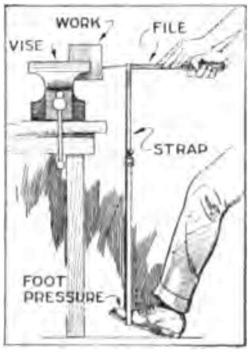
For gilding on bare wood, use a size made by mixing a small quantity of white wax, a little white soap, and a few drops of Venice turpentine. Permit this size to remain for about an hour, and lay the gold leaf upon it in the usual manner. It will take a very satisfactory burnish.—A. A. Kelly, Malvern, Pa.

Strap-Iron Hanger for Fire Buckets



The common type of support for fire water buckets, with the shelf and brackets underneath, is objectionable and often inconvenient. A type of hanger that is easily and inexpensively made is shown in the sketch. It is bent cold, or forged, from 1/8 by 1-in. strap iron, or material slightly heavier if the buckets are large. It is fastened to the wall with screws or bolts, and gives proper clearance for the bucket, used only for its proper purpose.

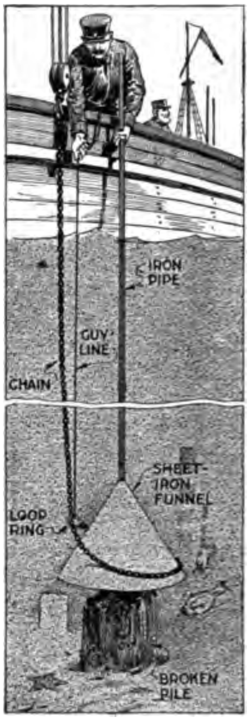
Foot-Pressure Strap an Aid in Filing



A considerable quantity of castings were made with a "blind" square opening in one side. These openings had to fit a gauge, and, due to defects in molding, they sometimes needed much filing. To file such a part is slow work, and tiring, the filing being done entirely on the point of the file. An ingenious arrangement by which this work was made easier is shown in the sketch. A leather stirrup for the workman's foot was attached to the file near the point end. As soon as the file is placed in each casting, the workman presses on the stirrup, exerting a pressure on the file greater than could be applied by hand, and at small effort.—D. A. Hampson, Middletown, New York.

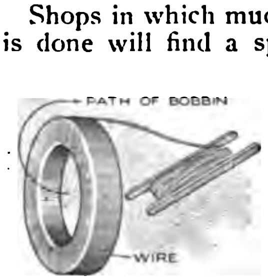
Funnel Device for Lifting Submerged Piles

When submerged piles from piers, foundations, or other structures, are to be removed, the services of a diver are usually necessary. In a job of this kind, where a number of piles broken off by the waves in a fishing ground, were to be raised, an ingenious device was used, and the piles brought to the surface without sending down a diver to adjust the chains. A large sheet-iron funnel was fastened to an iron pipe, as shown. The funnel was set over the pile, with the hauling chain looped over it. The chain was dropped into place, and the funnel withdrawn. The pile was then lifted by means of a powerful hoist.—Henry K. Pasma, Oostburg, Wisconsin.



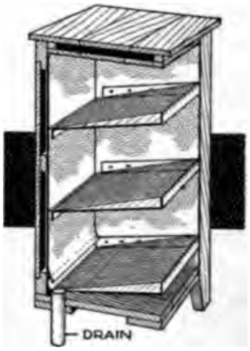
Special Bobbin for Winding Wire on Rings

Shops in which much electrical work is done will find a special bobbin for holding the wire of great value as a labor and timesaver. For such work as winding wire on small rings, the bobbin should be long and narrow, as shown in the sketch. The wire supply is wound on the bobbin, and during the process of winding, the latter is passed through the ring, around and through again, until the work is completed. This method avoids twisting and kinking of the wire.



Convenient Rack for Drying Laboratory Glassware

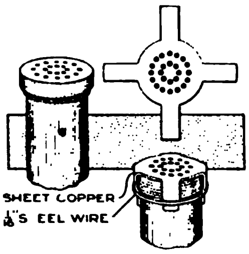
Space economy and better drying facilities for laboratory glassware are features of a newly designed, homemade rack in use in a dairy chemical laboratory. The frame of the rack is a wall case with open front, of convenient size. The interior rear wall of the case is covered with galvanized sheet iron, and the shelves are made of similar material. They are supported at the ends to slope toward the back. A small space is left between the shelves and the back of the case. The front and rear edges of each shelf are bent at a right angle, to make it rigid. Galvanized wire cloth forms the surface on which the glassware is inverted, after washing. The drip from these dishes runs to the shelf, and thence down the rear lining of the case to a shallow metal tray at the bottom shelf of the case. This tray is inclined toward a drain, as shown. No drip from the dishes on one shelf reaches those on the shelves below.



Electric-Light Bulbs Painted Black as Substitute for Shades

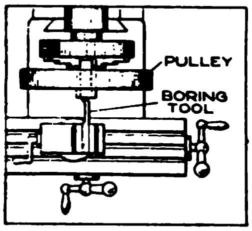
Switchboard lamps, and other lamps that are in a fixed position for reading instruments such as ammeters, voltmeters, etc., or where a permanent light is desired, may be shaded by painting half of the lamp black with ordinary black paint, or black shellac, instead of using the customary pear-shaped shade and reflector.—P. H. Roy, Kansas City, Mo.

Breather Cap for an Automobile Engine



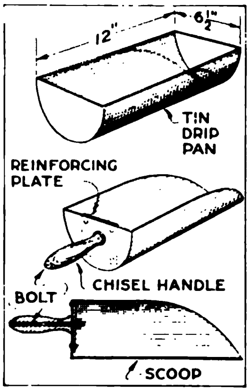
The losing of a breather cap on an automobile engine made it necessary to replace the cap quickly. A piece of sheet copper, 1/16 in. thick, was softened by heating, and permitting it to cool in the air. It was then cut to shape, as shown in the sketch. The small holes were drilled, and the four projections bent over the pipe in such a manner that they pressed tightly when the cap was in position. The ends were bent back a trifle to make it pass over the threads easily, and the cap was polished on a buffer. To prevent the cap from coming loose, a lock ring, of 1/16-in. steel wire, was applied.—Adolph Klein, New York, New York.

Milling Machine Set Up as Boring Mill



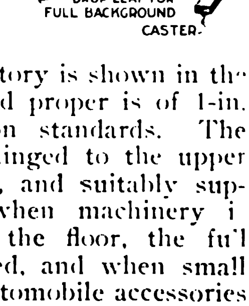
One of the special uses to which a milling machine may be put is as a boring mill. A job came in to our little shop: a pulley too large to swing on our largest lathe. The pulley was to be bored out and a bushing fitted in it. I chucked the pulley up on the milling machine, ran the table out, and placed on it the vise, into which I clamped a boring tool, as shown. I also turned up small chuck work, as well as work between chuck and center, and while it is not quite as handy as a lathe, yet it is a convenience in a "pinch."—Joe V. Romig, Allentown, Pa.

Strong Hand Scoop Made of Drip Pan



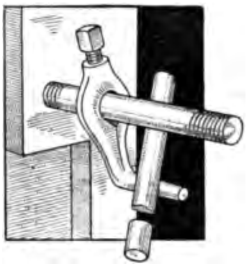
When a strong scoop was needed for use in the shop, it was found difficult to shape one with the tools and materials at hand. A large, unused oil drip pan from a shaft bearing was obtained, and easily converted for the purpose. One end was cut out and the sides shaped as shown. A reinforcing plate was riveted into the other end, and an old chisel handle was bolted through the end and the plate.—P. P. Avery, Garfield, N. J.

Photographic Background with Folding Shelf for Small Objects



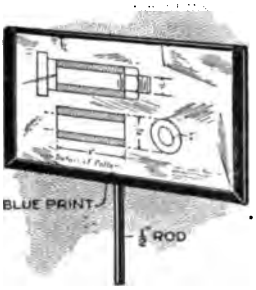
Backgrounds for photographic work are often made by stretching white canvas over a wooden frame. These frame backgrounds are light, and when there is much photographic work to be done in a factory, or shop, heavier construction is required. A 4 by 6-ft. white background used in a large factory is shown in the sketch. The board proper is of 1-in. stock, mounted on standards. The lower section is hinged to the upper section, as shown, and suitably supported. Thus, when machinery is photographed on the floor, the full background is used, and when small objects, such as automobile accessories or electrical devices, are photographed, the shelf is used.—K. M. Coggeshall, Webster Groves, Mo.

Heavy Stud Bolts Removed with Lathe Dog and Lever



Machinists sometimes find stud bolts set so firmly that the ordinary wrenches and devices for removing them are insufficient. Under these conditions, a simple method is to attach a heavy lathe dog to the bolt, as shown, and apply an iron bar as a lever. Tremendous force can be applied in this way, and the bolt easily removed. By reversing the pull, the bolt can be set very firmly.—W. Ichler, Kansas City, Mo.

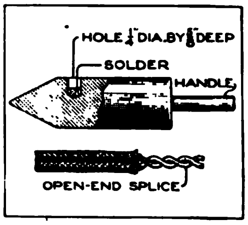
Blueprint Holder on Machines Aids Efficiency of Machinist



For the convenience of machinists, as well as an aid in keeping the work orders or blueprints clean, holders for them were made and placed on each machine and bench in a large shop. A rectangular section of sheet iron, slightly larger than the standard size of drawings employed, was bent to have three of its edges turned over to form a ½-in. border, as shown in the sketch. A strip of iron, ⅛ by ½ in., and of the necessary length, was riveted to the holder, at one end, and the other was fastened to the machine, or to a suitable portable base. The blueprint, placed in the holder, is thus always at hand, and well protected from dirt and the usual wear.—S. A. Groves, Minneapolis, Minn.

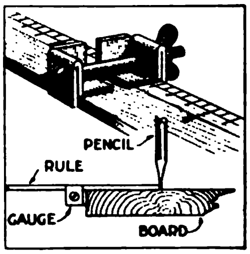
¶Pure turpentine dropped on a piece of white paper and exposed to the air, will leave no trace of foreign matter.

Soldering Iron Improved for Joining Splices



An improvement which can be made to any soldering iron, and which will prove very convenient, is shown in the sketch. A hole, ¼ in. in diameter and ⅝ in. deep, is drilled in the side of the iron and filled with solder. It is a timesaver for rapidly soldering twisted-wire joints. In this manner splices of the open-end variety may be made with much better results than by using the tip of the iron for soldering. The iron is heated until the solder in the hole melts, and then the splice, covered with soldering paste, or acid, is dipped into it. This makes a well-soldered joint in a remarkably short time.—P. J. M., New York, N. Y.

Adjustable Gauge for Rule or Straightedge



A favorite method of gauging, especially in rough work, is to use the end of the ruler, with the hand or fingers as a guide. A similar but better method is to fit the ruler with a homemade gauge, which clamps securely and quickly by means of a bolt and wing nut, as shown. The gauge is bent from two strips of sheet metal, each laid out flat in the shape of a right angle. The short ends are folded up and the longer ends are folded double, and holes for the clamping bolt are bored through the folded parts. The lower ends of the strips, at these folds, grip the edges of the rule, when the wing nut is set.—C. C. Spreen, Flint, Mich.

INDEX TO VOLUME XV

SHOP NOTES FOR 1919

Acetylene Flame, Wire across Lamp Relights 2984
Acid, Muriatic, in Water Restores Gold-Leaf 2936
Adding—Shop Device for Addition of Fractions 2954
Adhesion and Impulse Engine 2894
Aero Propelled Boat Sled 3042
Aeroplane, Ice Boat, Scooter and 3042
Agriculture—Fertilizing and Irrigating Farm with Muck from Lake Bed 3019
Agriculture—Kink in Cultivating Small Corn 2920
Air Check Valve Repair, Carburetor Improved by 3072
Air, Compressed, Small Blowpipe Torch Without 3088
Air Propeller, Long Island Ice Boat Hydroplane Driven by 3042
Air Pump Stuffing Box, Repair for 3007
Air Pumped through Water Jacket Cools Gasoline Motor 3000
Alining Tool for Shafting and Machinery 3065
Aluminum Salt Shaker Made into Lens Holder 3033
Angle Iron, Shear of, for Vise 2974
Angle Shaft Bearing Brackets, Fitting to Machine 3024
Angle Strengthens Loose Auto Fender 2939
Angle Valve, Low Pressure, Homemade 3002
Angle Washers, Leather, Stop Oil Leakage in Crank Case 3031
Anvil and Hammer, Saw Setting 2903
Anvil, Traveling Pulley and Angle Support at 2923
Apple Packing Table, Mounted on Wheels 2975
Arc Lamp Carbons, Old, Rheostat made from 2976
Arch, Triple, Light Wooden, Reinforcing 2936
Articles of Uniform Size, Small, Device for Wrapping 2948
Artist's Cabinet Made from Old Sideboard 2960
Artist's Palette, Supported by Easel 2941
Asbestos Packing, Liquid Glass Used to Make It Stick 2965
Atmosphere, Testing, in Polishing Rooms 2924
Auger, Post Hole, Two Shovels Used as 2903
Automobiles—Devices That Add Comfort to Winter Touring 3023
Automobiles—Repairing Small Tire Tube Punctures 2929
Automobile Axles, Bent, Straightening 3087
Automobile Bushings, Removing and Replacing 3058
Automobile, Dash Shelf for Order Books on 2944
Automobile, Double Hood Roadster 2897
Automobile Engine, Breather Cap for 3093
Automobile Engine, Frame for Assembling or Examining 2908
Automobile Engine Valve, Loose, Leather Cap Remedies 3054
Automobile Exhaust Gas, Ridding Garage of 2891
Automobile Fender, Loose, Angle Strengthens 2939
Automobile Fenders or Sheet Metal, Removing Dents from 2955
Automobile Fenders, Preventing Rapid Rusting of 2910
Automobile, Folding Table, Robe Rack, and Extra Compartment in 3015
Automobile Foot Brakes, One Man Method of Adjusting 3007
Automobile Generators and Starters, Locating Trouble in 2922
Automobile Intake Manifold, Copper Covering Transmits Heat to 2956
Automobile Magneto Coupling, Leather Covering for 2931
Automobile, Methodical Oiling Proves Economical 3056
Automobile Mudguard, Safety Mirror Attached to 2994
Automobile, Padded Compartments in, for Small Equipment 2938
Automobile, Passenger, Detachable Hauling Brackets on 2927
Automobile Radiator in Garage, Electric Pad Warms 2912
Automobile Radiator Paint, Liquid Shoe Polish Used as 3062
Automobile Radiators, Tool for Soldering 2952
Automobile Speeds, Formula for Calculating 2899
Automobile Spotlight, Electric, Arranged for Easy Focusing 3064
Automobile, Springs, Proper Care of 2931
Automobile Springs, Simple Device for Lubricating 3032
Automobile Starters and Generators, Locating Trouble in 2922
Automobile Tire Economy, Suggestions on 2980
Automobile Tires, Pointers on the Care of 2974
Automobile Tonneau, Foot Rest Locker Built into 3010
Automobile Truck, Makeshift Method of Lifting Out of Rut 3078
Automobile Used as Power Plant without Altering Car 3052
Automobile Vehicles, Grade Indicator for 2966
Automobile Washing Hose, Garage, Overhead Controls for 3061
Automobile Washing, Soap Used in Bag, Improves 3077
Automobiles and Motorboats, Suggestions on the Care of 2958
Auxiliary Jaws for Center and Turret Lathe Chucks 2920
Ax Handle, Tin on, Saves Wear 2949

Babbitting Drill in Drill Press Spindle Avoids Heavy Work 3062
Babbitting Mountings for Ball Bearings 2995
Back Rest, for Supporting Wood in Lathe 3013
Back Thrust, Safety Circular Saw Guard Prevents 3014
Background, Photographic, with Folding Shelf for Small Objects 3093
Background, Size of Objects Photographed Indicated by 2980
Backstop, Baseball, Portable, Built of Pipe and Wire Netting 2981
Bag, Soap Used in, Improves Auto Washing 3077
Baling Press, Paper, Homemade 3034
Ball Bearings, Babbitting Mountings for 2995
Ball Bearings Overcome Thrust in Gear Shaft 2929
Ball Valve, Safety Gas Cock with 3009
Bamboo and Sheet Fiber, Hollow Drill for Boring 3066
Band Saw Cabriole or Curved Furniture Legs 3006
Band Saw, Resawing Device for 3071
Barn, Homemade Power Hoist for Loading Hay in 2943
Barrel Sprinkler for Oiling Road 2950
Barrel, Swine Cafeteria in 2992
Barrel Truck made of Pipe and Fittings 2995
Barrel Water Filter 2908
Barrels, Heavy Tackle for Hoisting 3036

Barrels, Runway Over Oil Tanks Saves Lifting 3051
Barrels, Water, Casters on, Promote Fire Protection 3074
Barrow Truck, Pivoted Rear Caster Improves 3037
Bars, Pipes, Rods, Adjustable Roller Stand for 3032
Base, Concrete, Substantial and Economical, for Poles.......... 3063
Base, Structural Steel, Sliding, for Machinery and Motors.......... 2945
Baseball Backstop, Portable, Built of Pipe and Wire Netting.......... 2981
Battery Cups, Porous, Making.......... 3078
Battery, Storage, Carrying in Tool Box 2900
Batteries, Storage, Device Aids in Filling 3057
Bearing Brackets, Angle Shaft, Fitting to Machine.......... 3024
Bearing, Keyway Cut in, with Massed Hack Saws.......... 3081
Bearing, Three Point, Notch Gives, on Vertical Work 2912
Bearings of Moderate and High Speed Shafts 2950
Bearings, Oiling of.......... 2893
Bearings, Overhead, Oilcan Mounted on Pole for [illegible].......... 3091
Bell Signal Calls Automatic Machine Operator 2963
Belt Canvas Overcomes Slipping of.... 2931
Belt Guard Pivoted for Easy Removal. 2957
Belt Laces Not Crossed on Side Placed against Pulley 3068
Belt, Workmen's, Holder for Marking Punches Strapped to.......... 3062
Bench Dog, Handy Sheet Metal.......... 2964
Bench Drawer, Whetstone and Strop Kept Handily in.......... 2964
Bench, Lawn, Iron, Replacing Broken Foot on 2990
Benzine in First Coat Varnish Prevents "Crawling" 2987
Bicycle Sprocket, Boat's Wheel Made from 2910
Bin, Shop, Economizes Short Lengths of Steel 2947
Bins Built in Sections Provide for Increase in Capacity.......... 3072
Blacksmith's Tongs Made of Iron Strips Bent Cold 3046
Blast for Forge from Stream of Water 2990
Block for Starting Flow of Ink in Ruling Pen 3018
Block, Wooden, for Wrapping Small Articles of Uniform Size 2948
Blocks, Concrete, Lead Form Varies Face of.......... 2937
Blown Down Iron Smokestack, Reinforcing 2973
Blowpipe Torch, Small, without Compressed Air 3088
Blowtorch, Gas Mantle Fixture Used as 2989
Blowtorch, Heating Small Workshop by Means of 3056
Blowtorch from Strong Can, Homemade 3035
Blowtorch, Raising Level of Gasoline.. 2891
Blueprint and Roll Paper Box with Sheet Cutter 2968
Blueprint Holder on Machines Aids Efficiency of Machinist.......... 3094
Blueprint or Drafting Paper Rolls, Case at End of Table for.......... 3086
Blueprint Reproduction, Typewriting on Tracing Paper for 2982
Blueprints, Proper Method of Folding. 3033
Blueprints, Sink for Washing.......... 2891
Blueprints, Washing Rack for.......... 2979
Blueprints, Wheel Arrangement for Drying 3057
Board, Attachment Keeps T-Square Rigid on 3071
Boat Hydroplane Catamaran Built for Speed 2925
Boat, Collapsible Steps for Boarding... 2919
Boat, Motor, Building Fast Nineteen Foot Runabout 2887
Boat Sled, Aero Propelled.......... 3042
Boat, Small, Being Towed, Steadied by Dragging Bucket 3033
Boat, Small, Truck for Canoe or...... 2983
Boat's Wheel Made from Bicycle Sprocket.......... 2910
Bobbin, Special, for Winding Wire on Rings 3092
Boiler Furnace Stokers' Inspection Glass 2953
Boiler, Kitchen, Clothes Drier Attached to 3015
Bolt, Machine, Screwed Two and One-Half Times Its Diameter.......... 2946
Bolt, Stripped Nut Wedged on, in Emergency 3078
Bolt, Washer Holds from Turning in Clamping Groove 2952
Bolts, Stud, Heavy, Removed with Lathe Dog and Lever.......... 3094
Bonds, Metal, Hollow Tile Wall Construction Using 2968
Bottle, Washer on Neck of, Effective Marker on Poison Container.......... 2898
Book Fillers, Loose Leaf, Perforator for. 3020
Books, Order, Shelf for, on Auto Dash.. 2914
Borders, Concrete, on Walks, Protect Grassplots 3059
Boring Bamboo and Sheet Fiber, Hollow Drill for.......... 3066
Boring Job, Unusual, Done on Lathe... 3084
Boring Mill, Milling Machine Set Up as. 3093
Boring Mills, Device for Centering Work on 3017
Bottle Caps, Remover and Wall Receptacle for 2957
Bottles, Chuck on Emery Grinder Used for Washing.......... 2991
Box, Blueprint and Roll Paper, with Sheet Cutter.......... 2968
Box, Cheese, Revolving Nail Holder Made from 3059
Box, Mixing, Improved, for Mortar or Grouting 3003
Box, Shop Order, Saves Time of Workmen 2899
Box, Stuffing, Air Pump, Repair for.... 3007
Boxes for Small Hardware Display Contents 2952
Brace for Long Droplight Gas Fixture. 2937
Bracket, Folding, for Ladder.......... 2898
Brackets, Hauling, Detachable, on Passenger Auto 2927
Brackets, Insulator, Hinged, Prevent Breakage of Wires by Swaying.... 3000
Brads Hold Rods or Small Patterns... 2907
Brake Band Repaired with Spring Steel Strap 3050
Brass, Sheet, Inclose in Large Wrought Iron Pipe When Annealing.......... 3080
Breather Cap for Automobile Engine.. 3093
Bridge, Collapsing, for Moving Pictures 2921
Bridge, Foot, Novel, of Woven Wire.... 2988
Bronze Disk Takes up Thrust Wear in Pump 3051
Broom, Worn, Cut to Sharp Point at Side, Cleans Corners.......... 2943
Brush, Clip Supports in Pail.......... 2913
Brush or Swab, Bundle of Short Strings or Cords used 2899
Brush Preserver, Painter's, and Carrier 2892
Bucket, Small Boat Being Towed Steadied by Dragging.......... 3033
Buckets, Fire, Conical, Seldom Misused. 3084
Buckets, Fire, Strap Iron Hanger for . 3091
Buckle Tongues, Section from Cotter Pin Useful for Replacing.......... 2975
Builder's Survey Level with Sights from Old Rifle. 2992
Buildings, Equipped with Lightning Protection 2995
Bushing in Handle of Soldering Iron.. 2947
Bushing, Loose, Tightening.......... 2920
Bushing on Collar, Reaming without Reamer 2948
Bushings, Automobile, Removing and Replacing 3058
Bushings, Inserting in Motorcycle Connecting Rods.......... 3050
Bushings on Milling Machine, Jig for Slotting 2910
Button, Coat, Takes Up Slack in Plumb Line 3068
Buttons, Overall, That Pull Through, Saving 2949

Cabinet, Artist's, Made from Old Sideboard 2960

Cabinet, Drawing File, Protective Flap for Drawers of 2898
Cabinet, Folding, for Drafting Equipment 2997
Cable Trolley Rides over Guy Wires in Its Path 2999
Cableway for Handling Shipbuilding Material 2902
Cafeteria, Swine, in Barrel.......... 2992
Caliper, Sliding, Useful on Many Jobs.. 3049
Caliper with Locking Scale.......... 2928
Calks, Horseshoe, Preventing Rapid Wear on.......... 2952
Can for Recovering Oil from Chips and Sweepings 2964
Can, Strong, Blowtorch Homemade from 3035
Canoe or Small Boat, Truck for.......... 2983
Canvas Covered Wardrobe Protects Workmen's Clothes.......... 2982
Canvas Overcomes Slipping of Belt..... 2931
Cap, Leather, Remedies Loose Auto Engine Valve 3054
Cap Rings, Hook for Removing from Piling or Posts.......... 3026
Capstan, Makeshift, House Moved Over Snow with.......... 3051
Carbon Deposit in Compressor, Soapsuds Reduces 2894
Carbon Sheet, Proof on Letter Printing Machine Made with.......... 3026
Carboys, Tipping Cradle for.......... 2993
Carburetor Floats, Used with Gasoline, May be Varnished with Shellac....... 3036
Carburetor Improved by Air Check Valve Repair 3072
Carburetor Priming 3063
Carburetor, Tickler for Priming.......... 3063
Cardboard, Corrugated Convenient Drier for Photo Prints.. 2914
Cards, Garage Patrons Indicate Service Desired by 3068
Carrier, Hay, Rigged to Handle Excavation Dirt.......... 2927
Carrier, Painter's Brush Preserver and 2892
Cartridges, Fuse, Electrical, Test Box for 3041
Case at End of Table for Blueprint or Drafting Paper Rolls.......... 3086
Case, Double Action, Compression Coil Spring with.......... 2991
Case, Metal, with External Control for Knife Switch 3033
Case, Rack and, for Sterilizing Shop Goggles 2935
Casing, Concrete, Old Steel Columns Reinforced by.......... 2994
Caster, Pivoted, Rear, Improves Barrow Truck 3037
Casters on Water Barrels Promote Fire Protection 3074
Castings, Irregular, Stand for Stacking 2898
Catamaran, Hydroplane, Built for Speed 2925
Ceiling, Electric Switch Mounted on, for Safety 3088
Cellar Doors, Combined Hinge and Stop for 3026
Cellar, Storage, Round, for Farm....... 3031
Cement Bandage Repair on Large Pipes or Cylinders 3031
Cement Grouting, Dirt Collecting Corners Filled with 2916
Cement, Tough, for Pipe Joints.......... 2984
Cementing Gaps around Machinery Tension Keys 2943
Chalk on Letters on Machinery to Photograph 3083
Chamois Skin Wash Leather, Care of 2938
Channel Bars Mitered in Power Hacksaw 3024
Charcoal Forge Made of Washbasin and Concrete 2963
Charcoal Heating Stove Made of Flowerpots 2976
Check for Tools, Portable Tool Rack as Aid 3041
Check Holder, Revolving, for Lunch Rooms 3053
Cheese Box, Revolving Nail Holder Made from 3059
Charging Pan of Concrete Mixer, Cushion for.......... 2920
Chemical Containers, Glass, Cleaning.. 3018
Chips and Sweepings, Can for Recovering Oil from.......... 2964
Christmas Tree Ornaments, Novel Illuminated Flag Made of 3035
Chuck on Emery Grinder Used for Washing Bottles 2991
Chuck, Universal, Damaged, Repairing. 2896
Chucks, Lathe, Center and Turret, Auxiliary Jaws for.......... 2920
Chute, Rock or Gravel, Deflector for Bottom of 3037
Cigars, Racks for Pipes and, Aid "No Smoking" Enforcement.......... 3053
Circular and Hand Saws, Vise for Filing 3073
Circular Saw, Cutting Floor Openings with 2984
Circular Saw Guard, Safety, Prevents Back Thrust 3014
Circular Saw, Molding Head for........ 2934
Clamps, Hose, Tool for Applying Handily in Vise.......... 3014
Clamps, Machine, Made from Hexagon Nuts 2948
Clamps, Wooden, Refacing Jaws of....3010
Clamping Groove, Washer Holds Bolt from Turning in 2952
Cleaning, Directions Painted on Machine Save 2937
Cleaning Equipment, Janitor's, Portable Stand for.......... 3020
Cleats, Wax Prevents from Sticking.. 2911
Clip Holds Door of Terminal Boxes during Tests 2979
Clip, Spring, Locks Rolled Measuring Tape 3081
Clip Supports Brush in Pail.......... 2913
Clock Control, Automatic Poultry Feeder with 2929
Clock, Shop Timekeeping, Decimal Dial on 2913
Cloth Signs, Quick Drying, Paint for.. 2919
Clothes Drier Attached to Kitchen Boiler 3015
Clothes, Workmen's Canvas Covered Wardrobe Protects 2982
Coat Button Takes Up Slack in Plumb Line 3068
Coat Hook and Doorstop, Combination.. 3036
Coil Spring, Compression, with Double Action Case 2991
Coil Spring, Replacing.......... 3024
Coil Springs, Hints on Making and Use of 2912
Coil, Wire, Speed Indicator Counts Turns on 2977
Coils, Magnet, Small, Winding with Hand Drill.......... 3065
Cold, Hot Air Heater Protects Water Pipes from 3036
Cold Water Tank, Paraffin Repairs, Small Holes in.......... 3063
Collar, Bushing on, Reaming without Reamer 2948
Collar Setscrews Made from Ordinary Setscrews and Nuts.......... 3046
Collar, Stop, Riveted, for Pipe Connections to Flue.......... 3081
Color Changing Sign, Inexpensive..... 2977
Comb Used as Ruling Pen.......... 2935
Commutator, Motor, Turned up True in Position 3012
Commutators, Device for Undercutting Mica on 2969
Compressed Air Punch for Ceiling Workers 2917
Compressed Air Motor Drill Operates Windlass 2940
Compressed Air, Small Blowpipe Torch without 3088
Compressor, Soapsuds Reduces Carbon Deposit in 2894
Concrete Base, Substantial and Economical for Poles 3063
Concrete Blocks, Lead Form Varies Face of 2937
Concrete Borders on Walks Protect Grassplots 3059
Concrete Casing, Old Steel Columns Reinforced by 2994
Concrete, Charcoal Forge Made of Washbasin and 2963
Concrete Drinking Fountain, Sanitary.. 3003
Concrete, Farm Feed and Water Heater of 3016
Concrete Floors, Keeping Down Dust on 2933

Concrete, Grease on Mixing Machine Prevents Adhesion of 2993
Concrete, Horse Stalls of.............. 2914
Concrete Liners Overcome Wear at Turns in Flumes or Troughs......... 3038
Concrete Materials, Tip Boxes Measure, Economically 3080
Concrete, Miniature Landscape Built up of 2941
Concrete Mixer, Cushion for Charging Pan of.................................. 2920
Concrete, Reinforced, Garbage Can Housing of 2902
Concrete, Renewing Wooden Posts with 3013
Concrete, Sanitary Drinking Fountain of 3003
Concrete Tile Machine, Homemade...... 2895
Concrete Walk, Wire Mesh for Rough Surfacing. 2973
Connecting Rods, Motorcycle, Inserting Bushings in 3050
Construction Work, Reflector for Floodlighting 2912
Container, Poison, Washer on Neck of Bottle Effective Marker on............ 2898
Containers, Chemical, Glass, Cleaning.. 3018
Containers for Wood Finishing Materials, Paper Drinking Cups as......... 2930
Control, Clock, Automatic Poultry Feeder with 2929
Control, External, Metal Case with for Knife Switch 3033
Control, Remote, Electric Operation Recorder with 3082
Controls, Garage Overhead, for Auto Washing Hose 3061
Controls, Pedal, for Washbasin Faucets 3001
Copper Heater Coils, Leaky, Repairing. 2932
Core Prints, Simple Method of Making without Lathe 3018
Cords, Strings or, Bundle of, Used as Brush or Swab....................... 2899
Cork, Filing in Lathe.................. 2957
Corn, Small, Kink in Cultivating....... 2920
Corners, Dirt Collecting, Filled with Cement Grouting 2916
Corners, Outer, of Machine Parts Often Rounded 3089
Corners, Worn Broom Cut to Sharp Point at Sides, Cleans............... 2943
Cotter Pin, Section from, Useful for Replacing Buckle Tongues.............. 2975
Counter, Revolution, Rigged to Determine Lineal Travel on Machinery.... 3014
Counterbore Ground Quickly from Round Stock 3032
Countershaft, Double Drive, Arrangement 2979
Countershaft, Grinder as Winch for Hoisting 2970
Counting Parts, Small, by Weighing.... 2967
Coupler, Handle Forms, for Train of Trucks 2930
Coupling, Auto Magneto, Leather Covering for 2931
Coupling, Hose, Attaching with Vulcanized Joint 3010
Coupling, Hose, Positive Grip......... 2900
Coupling, Shaft, Quickly Made.......... 3025
Cover, Tin and Celluloid, Protects Shop Tally Cards 3062
Covering, Copper, Transmits Heat to Auto Intake Manifold................. 2956
Covering, Leather, for Auto Magneto Coupling 2931
Cradle, Tipping, for Carboys........... 2993
Crane, Traveling, for Farm............. 2983
Crank Case, Leather Angle Washers Stop Oil Leakage in..................... 3031
Crankshafts Ground to Balance without Weakening 3084
Cross Hairs, Broken, Repair for in Surveyor's Level 3061
Cups, Battery, Porous, Making......... 3078
Cups, Drinking, Paper, Containers for Wood Finishing Materials........... 2930
Cups, Oil, Remodeled to Adjustable Feed 2899
Curtain, Weather, for Converted Sleeping Room 2895
Curves, Circular, Adaptable Tool for Machining on Lathe 3016
Cushion for Charging Pan of Concrete Mixer 2920
Cushion Seat Folding Stool of Metal.. 2955
Cuspidors, Shop, Sanitary Shields for... 2909
Cutter, Pipe, Marks Round Stock for Sawing 2994
Cutter, Wire, Foot Lever, Made of Plier 2904
Cutters or Dies, Small, Kept on Safety Pins 2898
Cutting Pliers for Tool Room.......... 2910
Cylinder, Engine, Rigging for Reboring by Hand 2978
Cylinder Fins, Enlarging Aids in Cooling Engine 2982
Cylinders, Beveled Piston Rings Overcome Excess Oil in................... 2957
Cylinders, Pipes or, Large, Cement Bandage Repair on....................... 3031

Damper, Stove, Device for Opening Handily 3022
Danger Sign for Unsafe Grinding Wheel 2913
Decimal Dial on Shop Timekeeping Clock 2913
Deflection, Test of Steel Shelving for... 2918
Deflector for Bottom of Rock or Gravel Chute 3027
Dents, Removing from Auto Fenders or Sheet Metal 2965
Depth Gauge on Hand Saw............. 2933
Designs and Letters, Raised, Painted with Roller 3001
Desk, Double, Revolving File Cabinet on Saves Time 2973
Desk, Shop, Raising Increases Its Usefulness 2980
Developer, Operator Uses Care in Handling, if Fixing Bath has Touched Hands 3013
Dial, Decimal, on Shop Timekeeping Clock 2913
Dials, Enlarging on Milling Machine Produces Closer Work 3086
Dies and Machine Parts, Jigs for Piercings on 2970
Dies or Cutters, Small, Kept on Safety Pins 2898
Direct Reading Lever Micrometer...... 2951
Directions Painted on Machine Save Cleaning 2937
Dirt, Excavation, Hay Carrier Rigged to Handle 2927
Dirt, Keeping Out of Scale Pit......... 2913
Disk, Bronze, Takes up Thrust Wear in Pump 3051
Disks, Thin, Cutting Grooves in Edges of 3005
Door, Garage, Self Opening 2954
Door, Garage, Warning Horn at Sidewalk 2943
Door Knobs, Preventing Breaking of Plaster by 2893
Door of Terminal Boxes, Clip Holds During Tests 2979
Door, Ventilating, on Roof Opened from Ground 3015
Doors and Sash, Roller Skate Truck Saves Carrying 3005
Doors, Cellar Combined Hinge and Stop for 3026
Doors, Hay, Sliding Gable End, Easily Operated 2967
Doors, Railroad Car, Emergency Sash for 2953
Doors, Small, Quick Method of Making.. 3030
Doorsteps, Worn, Hinged Tread Covers Puddle at 2996
Doorstop and Coat Hook, Combination.. 3036
Double Action Case, Compression Coil Spring with 2991
Double Desk, Revolving File Cabinet on Saves Time 2973
Double Drive Countershaft Arrangement 2979
Drafting Board, Crosshatching Triangles Prevents Slipping on.................. 2979
Drafting Board, Extension for.......... 2931
Drafting Duplicate Parts, Time Saved by Marking Standard Shapes........ 2944
Drafting Equipment, Folding Cabinet for 2997
Drafting Ink Preliminary Sketches Prove Economical and Convenient.... 3076
Drafting Machine, Mechanical, Homemade 3072
Drafting Paper Rolls, Case Table for Blueprint or. 18

Drafting Room, Electric Drier Used in 2900
Drafting Sheets, Cutting Quickly from Roll of Paper 3058
Drafting Table Covered with Heavy Paper Has Good Working Surface... 2997
Drafting—Typewriting on Tracing Paper for Blueprint Reproduction 2982
Draftsman's Time, Wrench Template Saves 3066
Draftsmen, Celluloid Fillet Indicator Handy for 3077
Draftsmen, Nontipping Footstool Handy for 3083
Drain or Sewer Outlets, Preventing Rodents from Entering 3065
Drain Rainwater from Walk with Chipped Grooves 3023
Drain Tile, Method of Handling 2909
Drainage Pump Improvised on Job 3048
Drawer Key, Adjusting to Insure Privacy 2897
Drawers of Drawing File Cabinet, Protective Flap for 2898
Drawing File Cabinet, Protective Flap for Drawers of 2898
Drawing, Table for Mounting, on Muslin or Backing 2914
Drawings, Triangle Holder Aids in Inking 2923
Drier, Clothes, Attached to Kitchen Boiler 3015
Drier, Convenient, Corrugated Cardboard, for Photographic Prints 2914
Drier, Electric, Used in Drafting Room 2900
Drift Pin Handle, Handy Wrench with.. 2998
Drill, Babbitting, in Drill Press Spindle Avoids Heavy Work 3062
Drill, Compressed Air Motor, Operates Windlass 2940
Drill, Hand, Used as Lathe 2917
Drill, Hand, Winding Small Magnet Coils with 3065
Drill, Hollow, for Boring Bamboo and Sheet Fiber 3066
Drill Press, Power, Substantially Made of Pipes and Fittings 3039
Drill Press Spindle, Babbitting Drill in Avoids Heavy Work 3062
Drill Press Table Supports Tool Tray... 3008
Drill Rod, Extension Solderless 2950
Drilling Holes at Ends of Shafting, Jig for 2913
Drilling Holes in Pipe, Jig for 3074
Drilling Holes in Small Pieces, Monkey Wrench Used for 3054
Drinking Cups, Paper, Containers for Wood Finishing Materials 2930
Drinking Fountain, Sanitary, of Concrete 3003
Drip Pan, Strong, Hand Scoop Made of 3093
Drive, Left Hand, Changing Grinder to 3006
Droplight Gas Fixture, Long, Brace for 2937
Dust, Keeping Down on Concrete Floors 2933

Easel, Artist's Palette Supported by.... 2941
Easel, Folding, Painter's, Made of Flooring 3085
Electric Drier Used in Drafting Room.. 2900
Electric Gas Lighter 2916
Electric Light Bulbs Painted Black as Substitute for Shades 3092
Electric Operation Recorder, with Remote Control 3082
Electric Pad Warms Auto Radiators in Garage 2912
Electric Release Weight, Fire or Warning Whistle Operated by 3008
Electric Spot Welding Machine 3027
Electric Stove, Nonwarping Frying Plate for 2937
Electric Switch Controlled by Hinged Stair Tread 2938
Electric Switch Mounted on Ceiling for Safety 3088
Electricity—Methods of Testing Polarity of Line Wires 3087
Elevator, Freight, Gong Warning System for 2984
Emergency Lamp, Headlight as, for Operating Room 2891
Emergency Pipe Connection, Roofing Paper as 2984
Emergency Sash for Railroad Car Doors 2953
Emery Grinder, Chuck on Used for Washing Bottles 2991
Emery Wheel Dresser, Guard for 3072
Emery Wheel Dresser Made of Old Emery Wheel 3017
Engine, Adhesion and Impulse 2894
Engine and Mower, Small Power Plant Tractor Made of 2965
Engine, Automobile, Frame for Assembling or Examining 2908
Engine Cylinder, Rigging for Reboring by Hand 2978
Engine, Gas, Small, Starting Handle for 3008
Engine, Gas, Transported by Rolling It on Flywheel 2998
Engine Nut Recovered with Pill Box on Stick 2971
Engine or Machinery, Device Locates Pounding in 2912
Engine Parts, Disassembling Rack Keeps in Order 3040
Envelope Sealer, Pair Scissors Used as 2936
Erasing Shield Adjustable to Various Lines 2936
Excavation Dirt, Hay Carrier Rigged to Handle 2927
Expansion Plugs, Wooden, for Screws, Easily Made 3052
Extension Drill Rod, Solderless 2950
Extra Compartment, Folding Table, Robe Rack and, in Automobile 3015
Extractor, Post, Mounted on Wheels... 3057
Eye Magnet, Making of 2939
Eyeglass, Magnifying, Fitted into Spectacles 3069
Eyeglass Screws, Device Prevents Loosening of 2978
Eyeglasses, Broken, Improvised Frame for 2898
Eyeshade Carried Safely under Shoulder 2967

Faceplate Work, Indicator for Centering 2944
Fans on Machine Shafting Cool Workmen 2948
Farm, Fertilizing and Irrigating with Muck from Lake Bed 3019
Farm, Round Storage Cellar for 3031
Farm, Traveling Crane for 2983
Faucets, Washbasin, Pedal Controls for 3001
Feed and Water Heater, Farm, of Concrete 3016
Feed Mixer, Revolving 2909
Feed Water Pan, Automatic, for Furnaces 3012
Fence Wire, Device for Tightening 2919
Fender, Auto, Loose, Angle Strengthens 2939
Fenders, Auto, Preventing Rapid Rusting of 2910
Fertilizing and Irrigating Farm with Muck from Lake Bed 3019
Fiber, Bamboo and Sheet, Hollow Drill, for Boring 3066
File Cabinet, Revolving, on Double Desk Saves Time 2973
File, Small, Two Handles Used on 3070
Files, Pencil Sharpener with V-Groove Made from 2972
Filing Cabinet for Drawings, Protective Flap for Drawers of 2898
Filing Cork in Lathe 2957
Filing, Foot Pressure Strap Aid in 3091
Fillet Indicator, Celluloid, Handy for Draftsmen 3077
Fillets, Leather Pattern, Set in Shellac 2907
Filter, Water Barrel 2908
Finger Hold, Safety, Pulling Hook with 3054
Finger Tips, Sandpaper, Aid in Feeding Press 3059
Finish, Japanese, for Spruce 2917
Finish, Wood, Polished Black 2920
Fins, Cylinder Enlarging Aids in Cooling Engine 2982
Fire Buckets, Conical, Seldom Misused 3084
Fire Buckets, Strap Iron Hanger for.. 3091
Fire or Warning Whistle Operated by Electric Release Weight 3008
Fire Plug, Thawing Out Quickly 3025
Fire Protection, Casters on Water Barrels Promote 3074
Fixing Bath, if It has Touched Hands, Operator Uses Care in Handling Developer 3013

Flag, Illuminated, Novel, Made of Christmas Tree Ornaments........... 3035
Flag, Illuminated, Remains Unfurled.. 2900
Flap, Protective, for Drawers of Drawing File Cabinet 2898
Float, Metal, Hollow, Stopping Hole in.. 3008
Floats, Carburetor Used with Gasoline May be Varnished with Shellac...... 3036
Floodlighting Construction Work, Reflector for 2912
Floor Linoleum, Sawdust Foundation Levels 2940
Floor Openings, Cutting with Circular Saw 2984
Floor Pit, Small, Convenient for Sheet Metal Work 3050
Floor Plates, Iron, Slippery, Roughening 3001
Floor, Ropes Fed through from Basement Stock Room.................. 2956
Floors, Concrete, Keeping Down Dust on 2933
Flooring, Painter's Folding Easel Made of 3085
Flowerpots, Charcoal Heating Stove Made of 2976
Flue Cleaner, Steam Operated......... 2933
Flue, Riveted Stop Collar for Pipe Connection to 3081
Flumes or Troughs, Concrete Liners Overcome Wear at Turns in........ 3038
Flywheels, Gas Engine Transported by, Rolling on 2998
Folding Cabinet for Drafting Equipment 2997
Folding Easel, Painter's, Made of Flooring 3085
Folding Rule, Oil on Greatly Facilitates Use 2953
Folding Shelf for Small Objects, Photographic Background with......... 3093
Folding Table, Robe Rack, and Extra Compartment in Automobile........ 3015
Foot Brakes, Auto, One Man Method of Adjusting 3007
Foot Bridge, Novel, of Woven Wire.... 2988
Foot, Broken, Replacing on Iron Lawn Bench 2990
Foot Lever Wire Cutter Made of Plier.. 2904
Foot Pressure Strap, Aid in Filing.... 3091
Foot Rest Locker Built into Auto Tonneau 3010
Footstool, Nontipping, Handy for Draftsmen 3083
Forge, Blast for, from Stream of Water 2990
Forge, Charcoal, Made of Washbasin and Concrete 2963
Forge Fire for Intermittent Use, Hood Confines 3010
Forge, Stove Lid Used to Repair...... 2972
Formula for Calculating Auto Speeds.. 2899
Fountain, Drinking, Sanitary, of Concrete 3003
Fractions, Shop Device for Addition of 2954
Frame for Assembling or Examining Automobile Engine 2908
Frame, Hack Saw, Emergency.......... 2969
Frame, Improvised, for Broken Eyeglasses 2898
Freight Car Frames, Method of Straightening 3063
Freight Elevator, Gong Warning System for 2984
Fuel Supply, Reserve, Special Outlet on Gasoline Tank Provides............. 3077
Fumes, Double Ventilator Hood Draws Away Quickly 2940
Fumigating Plants with Tobacco Smoke 2930
Funnel Device for Lifting Submerged Piles 3092
Furnace, Automatic Feed Water Pan for 3012
Furniture Legs, Cabriole or Curved, Band Sawing 3006
Fuse Cartridges, Electrical, Test Box for 3041
Fuse Circuit, Emergency, for Moving Picture Lanterns 2995

Gable End Hay Doors, Sliding, Easily Operated 2967
Gaps, Cementing around Machinery Tension Keys 2943
Garage, Auto Washing Hose, Overhead Controls for 3061
Garage Door, Self Opening............ 2954
Garage Door Warning Horn at Sidewalk 2943
Garage, Electric Pad Warms Automobile Radiator in 2912
Garage or Shop, Large Grease Gun for.. 2938
Garage Patrons Indicate Service Desired by Cards......................... 3068
Garage, Ridding of Automobile Exhaust Gas 2891
Garage Roof as Playhouse 2904
Garage, Small, Turntable for........... 3079
Garbage Can Housing of Reinforced Concrete 2902
Garden Harrow, Spiked Roller.......... 2901
Garden Hose Rollers for Graining Woodwork 2910
Gas, Automobile Exhaust, Ridding Garage of 2891
Gas Cock, Safety, with Ball Valve..... 3009
Gas Engine, Small, Starting Handle for 3008
Gas Engine Transported by Rolling Flywheel 2998
Gas Engine Water Jacket, Temporary Pump for Cooling.................... 2959
Gas Fixture, Long Droplight, Brace for 2937
Gas Lighter, Electric.................. 2916
Gas Mantle Fixture Used as Blowtorch 2989
Gaskets, Device for Setting in Pipe Joints 3085
Gasoline Motor, Air Pumped through Water Jacket Cools 3000
Gasoline Motor Piston Rings, Fitting Accurately 3016
Gasoline, Raising Level of in Blowtorch 2891
Gasoline Tank, Special Outlet on Provides Reserve Supply 3077
Gate Adjustable to Heavy Snowfall.. 3061
Gate, Strong, Built of Iron Pipe...... 3064
Gauge, Adjustable, for Rule or Straightedge 3094
Gauge, Depth, on Hand Saw 2933
Gauge Determines Diametral Pitch of Gears 2976
Gauge Pins, Printing Press, Made of Paper 3052
Gauge, Shingles Set by, on Shingling Hatchet 3030
Gear Box, Preventing Oil Leakage in... 2917
Gear Shaft, Ball Bearings Overcome Thrust in 2929
Gears, Fiber or Paper, Repairing Broken Teeth in 2955
Gears, Gauge Determines Diametral Pitch of 2976
Generator, Heavy, Improvised Rigging for Lifting 2907
Generators and Starters, Automobile, Locating Trouble in 2922
Generators, Low Voltage, Building Up.. 3067
Gilding on Bare Wood 3091
Glass in Picture Frames Not Fitted Tightly 3083
Glass, Inspection, Boiler Furnace Stokers' 2953
Glass, Liquid, Used to Make Asbestos Packing Stick 2965
Glass Rod Used as Parallel Ruler...... 2947
Glass, Scraping Paper from, Safety Razor Blade Device for............. 2978
Glass, White Opal, Useful for Headlights 2994
Glassware, Laboratory, Convenient Rack for Drying.......................... 3092
Glazing, Putty for, Contains White Lead 2916
Goggles, Shop, Rack and Case for Sterilizing 2935
Goggles, Weight of Relieved by Rubber Band 3060
Gold Leaf, Manipulation of........... 2896
Gold Leaf, Muriatic Acid in Water Restores 2936
Gong Warning System for Freight Elevator 2984
Gongs, Old Street Car, Used as Hardware Trays 2969
Grade Indicator for Motor Vehicles.... 2966
Graining Woodwork, Garden Hose Rollers for 2910
Granite Ware, Simple Method of Soldering 3040
Grassplots, Concrete Borders on Walks Protect 3059
Gravel of Rock Chute, Deflector for Bottom of 3037
Grease Gun, Large, for Garage or Shop. 2938

Grease on Mixing Machine Prevents Adhesion of Concrete.................. 2993
Grinder as Winch for Hoisting Countershaft 2970
Grinder, Changing to Left Hand Drive.. 3006
Grinder, Emery, Chuck on, Used for Washing Bottles 2991
Grinder, Large Wheel Refaced on Lathe Rigged as 3009
Grinder, Motor Driven, for Rail Joints.. 3076
Grinding, Turning, and Sawing Machine, Combination 3011
Grinding Wheel, Unsafe, Danger Sign for 2913
Groove, Clamping, Washer Holds Bolt from Turning in......................... 2952
Groove Plane, Small, Made from Steel Strip 3069
Grooves, Chipped, Drain Rainwater from Walk 3023
Grooves, Cutting in Edges of Thin Disks 3005
Grooving and Rabbeting Tool of Wide Use 3090
Grouting, Cement, Dirt Collecting Corners Filled with.......................... 2916
Grouting, Mortar or, Improved Mixing Box for 3004
Guard, Belt, Pivoted for Easy Removal. 2957
Guard for Emery Wheel Dresser...... 3072
Guard, Safety, for Exposed Shafting.. 2922
Guard, Shoe, for Shovel................ 3085
Guide for Cutting Triangular Strips on Circular Saw 3002
Guide Strip, Brass, for T-Square....... 2972
Guides, Worn, Patching in Wooden Miter Box 3084
Gun, Grease, Large, for Garage or Shop 2938
Guy Wires, Cable Trolley Rides Over, in Its Path 2999

Hack Saw Frame, Emergency........ 2969
Hack Saw, Power, Channel Bars Mitered in 3024
Hack Saws Do Better Work When Properly Selected 3085
Hack Saws, Massed, Keyway Cut in Bearing with 3081
Hairs, Cross, Repair for in Surveyor's Level 3061
Hammer and Anvil, Saw Setting........ 2903
Hand Drill Used as Lathe.............. 2917
Hand Drill, Winding Small Magnet Coils with 3065
Hand, Moving, Draws Attention to Window Display 3048
Hand Saw, Depth Gauge on............ 2933
Hand Scoop, Strong, Made of Drip Pan 3093
Hand Tool for Making Mortise-and-Tenon Joints 2960
Handcart for Railroad Tracks.......... 3007
Handle, Drift Pin, Handy Wrench with 2998
Handle, Fitting to Pick................ 2975
Handle Forms Coupler for Train of Trucks 2930
Handle, Soldering Iron with Bushing in 2947
Handle, Starting, for Small Gas Engine 3008
Handles, Tool, Small, Old Paintbrushes Provide 3052
Handles, Two, Used on Small File...... 3070
Hanger, Shaft and Fittings for Small Shop 3021
Hanger, Strap Iron, for Fire Buckets.. 3091
Hardware, Small, Boxes for Display Contents 2952
Hardware, Small, Rivets and Wall Pockets for Storing 3025
Hardware Trays, Old Street Car Gongs Used as 2969
Harrow, Garden, Spiked Roller........ 2901
Hay Carrier Rigged to Handle Excavation Dirt 2927
Hay, Homemade Power Hoist for Loading in Barn 2943
Hay Shed, Adjustable 2930
Haymow Doors, Gable End, Sliding, Easily Operated 2967
Headlight as Emergency Lamp for Operating Room 2891
Headlights, White Opal Glass Useful for 2994
Heat, Copper Covering Transmits to Auto Intake Manifold.................. 2956
Heat, Smooth Soldering Iron Transmits More 2923
Heater Coils, Copper, Leaky, Repairing. 2932
Heater, Farm Feed and Water, of Concrete 3016
Heater, Hot Air, Protects Water Pipes from Cold 3036
Hinge and Stop, Combined, for Cellar Doors 3026
Hoist, Power, Homemade, for Loading Hay in Barn 2943
Hoist, Tackle for, for Heavy Barrels.. 3036
Hoisting Countershaft, Grinder as Winch for 2975
Holder for Marking Punches Strapped to Workman's Belt 3062
Holder for Slip Stones 2892
Holder for Wood Turning Tools........ 2956
Holder, Tool, for High Speed Steel..... 2927
Holder, Triangle, Aids in Inking Drawings 2923
Hole, Repairing in Small Water Tank.. 2990
Hole, Stopping in Hollow Metal Float.. 3008
Holes, Round, in Sheet Metal, Makeshift Tool Cuts 3088
Holes, Jig for Drilling at Ends of Shafting 2913
Holes, Jig for Drilling in Pipe 3074
Holes, Monkey Wrench Used in Drilling in Small Pieces 3054
Holes, Small, Paraffin Repairs in Cold Water Tank 3063
Hollow Drill for Boring Bamboo and Sheet Fiber 3066
Hollow Tile Wall Construction Using Metal Bonds 2968
Home or Office, Selection of Illuminating Units for 3047
Hood Confines Forge Fire for Intermittent Use 3010
Hook for Removing Cap Rings from Piling or Posts 3026
Hook, Pulling, with Safety Finger Hold 3054
Horn, Warning, at Garage Door, at Sidewalk 2943
Horse Stalls of Concrete 2914
Horseshoe Calks, Preventing Rapid Wear on 2952
Hose Clamps, Tool for Applying Handily in Vise 3014
Hose Coupling, Attaching with Vulcanized Joint 3010
Hose Coupling, Positive Grip 2900
Hose, Washing, Auto Garage Overhead Controls for 3061
Hose, Water, Device for Repairing..... 2904
Hot Air Heater Protects Water Pipes from Cold 3036
House Moved over Snow with Makeshift Capstan 3051
Housing, Garbage Can, of Reinforced Concrete 2902
Hydraulic, Ram, Homemade 2971
Hydroplane Catamaran, Built for Speed. 2925

Ice Boat, Scooter and Aeroplane Propeller 3042
Illuminated Flag, Novel, Made of Christmas Tree Ornaments 3035
Illuminated Flag Remains Unfurled.... 2900
Illuminating Units, Selection of, for Home or Office 3047
Incandescent Lamps Used in Stereopticon Lanterns 2949
Inclines to Platform Scale Save Lifting 2963
Indicator, Fillet, Celluloid, Handy for Draftsmen 3077
Indicator for Centering Faceplate Work 2944
Indicator, Grade, for Motor Vehicles.... 2966
Indicator, Speed, Counts Turns on Wire Coil 2977
Indicator, Water and Tube Level, Homemade 3086
Indicators, Metal Point, Require Specially Coated Paper 2960
Inflating Tires, Valve and Stand for.. 2949
Ink—Triangle Holder Aids in Inking Drawings 2923
Ink, Block for Starting Flow of in Ruling Pen 3018
Ink Handily Transferred to Ruling Pen 2996
Ink Preliminary Sketches, Drafting, Prove Economical and Convenient.... 3078
Inspection Glass, Boiler Furnace Stokers' 2953
Instrument Knobs, Rubber Covered, Made from Sink Stoppers 3050

Instruments, Surveyor's, Rack Safeguards 2947
Insulator Brackets, Hinged, Prevent Breakage of Wires by Swaying 3000
Insulators, Porcelain, Cutting......... 2892
Intake Manifold, Auto, Copper Covering Transmits Heat to.................. 2956
Irrigation—Fertilizing and Irrigating with Muck from Lake Bed 3019
Iron, Cleaned, Paraffin Oil Protects 3041
Iron Floor Plates, Slippery, Roughening 3001
Iron, Painting to Withstand Wear.... 2908
Iron Pipe, Strong Gate Built of......... 3064

Janitor's Cleaning Equipment, Portable Stand for 3020
Jaws, Auxiliary, for Center and Turret Lathe Chucks 2920
Jaws of Wooden Clamps, Refacing 3010
Jig for Drilling Holes at Ends of Shafting 2913
Jig for Drilling Holes in Pipe 3074
Jig for Piercings on Dies and Machine Parts 2970
Jigs for Slotting Bushings on Milling Machine 2910
Joint, Vulcanized, Attaching Hose Coupling with 3010
Joints, Leaks at, Soapy Water on Pressure Pipes Locates.................. 3069
Joints, Pipe, Tough Cement for........ 2984

Key, Drawer, Adjusting to Insure Privacy 2897
Keys, Tension, Machinery, Cementing Gaps around 2943
Keyway Cut in Bearing with Massed Hack Saws 3081
Kitchen Boiler, Clothes Drier Attached to 3015
Knee Lever Actuates Shift Key on Typewriter 3049
Knobs, Door, Preventing Breaking of Plaster by 2893
Knobs, Instrument, Rubber Covered, Made from Sink Stoppers............ 3050
Knobs, Two, Spool Cut at Middle Provides 2891
Knife Switch, Metal Case with External Control for 3033

Laboratory and Workshop, Homemade Wire Tools for 3070
Laboratory Glassware, Convenient Rack for Drying 3092
Laboratory or Shop, Trolley Tool Rack for 2893
Laces, Belt, Not Crossed on Side Placed against Pulley 3068
Ladder End, Nonslipping 2964
Ladder, Folding Bracket for 2898
Ladder, Shop, Made of Pipe and Fittings 2973
Ladder with Wheelbarrow Fixture for Repair Work 3077
Lake Bed, Fertilizing and Irrigating Farm with Muck from 3019
Lamp Carbons, Arc Old, Rheostat Made from 2976
Lamp, Emergency, Headlight as, for Operating Room 2891
Lamp Standard, High Portable, for Shop Lighting 2980
Lamp, Window, with Revolving Shade Attracts Attention 3022
Lamp, Wire across, Relights Acetylene Flame 2984
Lamps for Stock Room Shifted along Horizontal Wires 3049
Lamps, Incandescent, Used in Stereopticon Lanterns 2949
Landscape, Miniature, Built Up of Concrete 2941
Lanterns, Moving Picture, Emergency Fuse Circuit for 2995
Lanterns, Stereopticon, Incandescent Lamps Used in 2949
Lathe, Adaptable Tool for Machining Circular Curves on 3016
Lathe, Back Rest for Supporting Wood in 3013
Lathe, Centering Halved Pattern Work in 3046
Lathe Chucks, Center and Turret, Auxiliary Jaws for 2920
Lathe Dog and Lever, Heavy Stud Bolts Removed with 3094
Lathe Dog, Steel Roller, for Making Small Spindles 2966
Lathe, Filing Cork in 2957
Lathe, Hand Drill Used as............. 2917
Lathe Rigged as Grinder, Large Wheel Refaced on 3009
Lathe, Simple Method of Making Core Prints without 3018
Lathe, Spider for Cutting Large Pipe in 2956
Lathe, Unusual Boring Job Done on.. 3084
Lathe, Wood in, Back Rest for Supporting 3013
Lathing, Stand Quickly Made for....... 2922
Lawn Bench, Iron, Replacing Broken Foot on 2990
Lead Form Varies Face of Concrete Blocks 2937
Leaks at Joints, Soapy Water on Pressure Pipes Locates 3069
Leather Angle Washers Stop Oil Leakage in Crank Case 3031
Leather Cap Remedies Loose Auto Engine Valve 3054
Leather Covering for Auto Magneto Coupling 2931
Leather Pattern Fillets Set in Shellac.. 2907
Leather, Wash, Chamois Skin, Care of.. 2938
Lens Holder, Aluminum Salt Shaker Made into 3033
Letter Paper, Government Size, Economy by Use of 2970
Letter Printing Machine, Proof on, Made with Carbon Sheet 3026
Letters and Designs, Raised, Painted with Roller 3001
Letters on Machinery Chalked White for Photographing 3083
Level, Builder's Survey, with Sights from Old Rifle 2992
Level Indicator, Water and Tube, Homemade 3086
Lever, Knee, Actuates Shift Key on Typewriter 3049
Lever, Lathe Dog and Heavy Stud Bolts Removed with 3094
Level, Surveyor's, Repair for Broken Cross Hairs in...................... 3061
Lid, Pedal Control, Sanitary Shop Refuse Can with 3038
Lifting Heavy Generator, Improvised Rigging for 2907
Light Fixture, Weatherproof, Cheaply Made 3076
Light Fixtures—Selection of Illuminating Units for Home or Office......... 3047
Lightning Protection, Equipping Buildings with 2985
Line Wires, Methods of Testing Polarity of 3087
Lineal Travel on Machinery, Revolution Counter Rigged to Determine 3014
Liners, Concrete, Overcome Wear at Turns in Flumes or Troughs 3038
Lines, Various, Erasing Shields Adjustable to 2936
Linoleum, Floor, Sawdust Foundation Levels 2940
Liquid Glass Used to Make Asbestos Packing Stick 2965
List Printing Machine for Use with Rubber Type 2932
Locker, Foot Rest, Built into Auto Tonneau 3010
Loose Leaf Book Fillers, Perforator for 3030
Low Pressure Angle Valve, Homemade 3002
Low Voltage Generators, Building Up.. 3067
Lubricating Oil, Testing Its Qualities.. 2911
Lunch Rooms, Revolving Check Holder for 3053

Machine Parts, Outer Corners Often Rounded 3089
Machine Parts, Small, Device for Tapping 2928
Machine Parts, Small, Tool for Grasping 3020
Machine Parts, Jigs for Piercings on.. 2970
Machinery—Counting Small Parts by Weighing 2967

Machinery—Pencil Held to Teeth Detects Knocks in Inclosed Machine ... 3048
Machinery and Motors, Structural Steel Sliding Base for ... 2945
Machinery, Letters on, Chalked White for Photographing ... 3083
Machinery or Engine, Device Locates Pounding in ... 2912
Machinery, Shafting and, Alining Tool for ... 3065
Machinist, Blueprint Holder on Machines Aids Efficiency of ... 3094
Magnet Coils, Small, Winding with Hand Drill ... 3065
Magnet, Eye, Making of ... 2939
Magnet, Small, Useful in Woodshop ... 3037
Magnetism, Proper Residual, Building up ... 3067
Manifold, Auto Intake, Copper Covering Transmits Heat to ... 2956
Marker, Effective, on Poison Container, Washer on Neck of Bottle is ... 2898
Marking Punches, Holder Strapped to Workman's Belt ... 3062
Marking Stakes, Wedge Shaped, Prove Superior ... 2990
Mask for Small Negatives Printed on Post Cards ... 3074
Measuring Tape, Rolled, Spring Clip Locks ... 3081
Measuring Velocity of Steam ... 2998
Messenger, Novel Method of Strapping Money Satchel to ... 3046
Metal, Molten, Skimmer for Removing Slag from ... 2948
Mica, Device for Undercutting, on Commutators ... 2969
Mica Washers, Tray for Storing without Damage ... 2936
Micrometer, Direct Reading Lever ... 2951
Mill Room, Portable Tool Rack for, Aids in Checking Up Tools ... 3041
Milling Machine, Enlarging Dials on Produces Closer Work ... 3086
Milling Machine, Jig for Slotting Bushings on ... 2910
Milling Machine Set Up as Boring Mill 3093
Miniature Landscape Built Up of Concrete ... 2941
Miter Box, Wooden, Patching Worn Guides in ... 3084
Mixer, Feed, Revolving ... 2909
Mixer, Concrete, Cushion for Charging Pan of ... 2920
Mixing Box, Improved, for Mortar or Grouting ... 3004
Mixing Machine, Grease on Prevents Adhesion of Concrete ... 2993
Molding Head for Circular Saw ... 2934
Molds, Plaster, Wax Patterns for Making 2901
Money Satchel, Novel Method of Strapping to Messenger ... 3046
Monkey Wrench Used for Drilling Holes in Small Pieces of Metal ... 3054
Mortar or Grouting, Improved Mixing Box for ... 3004
Mortise-and-Tenon Joints, Hand Tools for Making ... 2960
Motor Commutator Turned Up True in Position ... 3012
Motor Drill, Compressed Air, Operates Windlass ... 2940
Motor Vehicles, Grade Indicator for ... 2966
Motors and Machinery, Structural Steel Sliding Base for ... 2945
Motorboat, Runabout, Fast Nineteen-Foot, Building ... 2887
Motorboats, Automobiles and, Suggestions on Care of ... 2958
Motorcycle Connecting Rods, Inserting Bushings in ... 3050
Motorcycle Nut, Broken, Repaired on Road ... 3026
Mountings, Babbitting for Ball Bearings 2995
Moving Picture Lanterns, Emergency Fuse Circuit for ... 2995
Moving Pictures, Collapsing Bridge for 2921
Mower, Engine and, Small Power Plant Tractor Made of ... 2965
Muck from Lake Bed, Fertilizing and Irrigating Farm with ... 3019
Mudguard, Auto, Safety Mirror Attached to ... 2994
Muffler for Injecting Steam into Water Tank ... 3061
Muriatic Acid in Water Restores Gold Leaf ... 2936
Muslin or Backing, Table for Mounting Drawings on ... 2914

Nail Holder, Revolving, Made from Cheese Box ... 3059
Nail, Large, Ripsaw Cuts, without Injury ... 2994
Negatives, Photographic, Local Reductions of Density in ... 2903
Negatives, Small, Mask for, Printed on Post Cards ... 3074
Nonslipping Ladder End ... 2964
Nontipping Footstool Handy for Draftsman ... 3083
Notch Gives Three Point Bearing on Vertical Work ... 2912
Nut, Engine, Recovered with Pill Box on Stick ... 2971
Nut, Machine, Soldering to Sheet Metal 2916
Nut, Motorcycle, Broken, Repaired on Road ... 3026
Nut, Stripped, Wedged on Bolt in Emergency ... 3078
Nuts, Hexagon, Machine Clamps, Made from ... 2948
Nuts, Ordinary Setscrews and, Collar Setscrews Made from ... 3046

Oak Easily Spotted by Machine Oil ... 2974
Objects, Photographed, Size of, Indicated by Background ... 2980
Office, Home or, Selection of Illuminating Units for ... 3047
Oil, Can for Recovering, from Chips and Sweepings ... 2964
Oil Cups Remodeled to Adjustable Feed 2899
Oil, Excess, Beveled Piston Rings Overcomes in Cylinders ... 2957
Oil Leakage in Crank Case, Leather Angle Washers Stop ... 3031
Oil Leakage in Gear Box, Preventing ... 2917
Oil, Machine, Oak Easily Spotted by ... 2974
Oil on Folding Rule Greatly Facilitates Use ... 2953
Oil, Paraffin, Protects Cleaned Iron ... 3041
Oil, Raw Linseed, Coat of, Brightens and Preserves Old Paint ... 2902
Oil, Rubber Goods Kept Pliable by ... 3012
Oil Tanks, Runway over Saves Lifting of Barrels ... 3051
Oils, Testing for Lubricating Qualities 2911
Oilcan Mounted on Pole for Oiling Overhead Bearings ... 3091
Oiling Auto, Methodical Method Proves Economical ... 3056
Oiling of Bearings ... 2893
Oiling Road, Barrel Sprinkler for ... 2950
Operating Room, Headlight as Emergency Lamp for ... 2891
Operation Recorder, Electric, with Remote Control ... 3082
Operator, Automatic Machine, Bell Signal Calls ... 2963
Operator Uses Care in Handling Developer if Fixing Bath Has Touched Hands ... 3013
Orchestra Pit Rail Used as Speaking Tube ... 2923
Order Books, Shelf for on Auto Dash ... 2944
Outlet, Special, on Gasoline Tank Provides Reserve Supply ... 3077
Outlets, Drain or Sewer, Preventing Rodents from Entering ... 3065
Overall Buttons That Pull Through, Saving ... 2949

Packing, Asbestos, Liquid Glass Used to Make It Stick ... 2965
Pad, Electric, Warms Auto Radiator in Garage ... 2912
Padded Compartments in Auto for Small Equipment ... 2938
Pail, Clip Supports Brush in ... 2913
Paint, Auto Radiator, Liquid Shoe Polish Used as ... 3062
Paint Directions on Machine and Save Cleaning ... 2937
Paint Iron to Withstand Wear ... 2908

Paint, Old, Outside, Coat of Raw Linseed Oil Brightens and Preserves 2902
Paint, Old, Torch for Burning Off..... 2993
Paint Quick Drying Cloth Signs........ 2919
Paintbrushes, Old, Provide Small Tool Handles 3052
Painter's Brush Preserver and Carrier.. 2892
Painter's Folding Easel Made of Floor- 3085
ing 3085
Palette, Artist's, Supported by Easel.. 2941
Pan, Charging, Cushion for, of Concrete Mixer 2920
Pan, Feed Water, Automatic, for Furnaces 3012
Paper Baling Press, Homemade....... 3034
Paper Drinking Cups as Containers for Wood Finishing Materials........... 2930
Paper, Heavy, Drafting Table Covered with, Has Good Working Surface... 2997
Paper, Printing Press Gauge Pins Made of 3052
Paper, Roll of, Cutting Drafting Sheets Quickly from 3058
Paper, Roofing, as Emergency Pipe Connection 2984
Paper, Scraping from Glass, Safety Razor Blade Device for............. 2978
Paper, Specially Coated, Metal Point Indicators Require 2960
Paper, Wafer Razor Blade Device for Scraping from Glass 2978
Paper Weights, Padded and Flexible .. 2927
Paraffin Repairs Small Holes in Cold Water Tank 3063
Paraffin Oil Protects Cleaned Iron..... 3041
Parallel Ruler, Glass Rod Used as..... 2947
Pattern Fillets, Leather, Set in Shellac. 2907
Pattern Making—Simple Method of Making Core Prints without Lathe...... 3018
Pattern Work, Halved, Centering in Lathe 3046
Patterns, Small, Brads Hold Rods on.. 2907
Pedal Control Lid, Sanitary Shop Refuse Can with 3038
Pedal Controls for Washbasin Faucets.. 3001
Pen, Ruling, Comb Used as............ 2935
Pencil Held to Teeth Detects Knocks in Inclosed Machine 3048
Pencil Sharpener with V-Groove Made from Files 2972
Perforator for Loose Leaf Book Fillers 3030
Photograph, Letters on Machinery Chalked White for 3083
Photography — Corrugated Cardboard Convenient Drier for Prints.......... 2914
Photography—Local Reductions of Density in Negatives 2903
Photography—Mask for Small Negatives Printed on Post Cards.............. 3074
Photography—Operator Uses Care in Handling Developer If Fixing Bath Has Touched Hands 3013
Photography—Prints Sink in Wash Water If Forced in Development..... 2927
Photography—Size of Objects Indicated by Background 2980
Pick, Fitting Handle to 2975
Picture Frames, Glass in Not Fitted Tightly 3083
Pile of Rods Protected by Painted Stripe 3018
Piles, Submerged, Funnel Device for Lifting 3092
Piling or Posts, Hook for Removing Cap Rings from 3026
Pill Box on Stick, Engine Nut Recovered with 2971
Pin, Cotter, Section from, Useful for Replacing Buckle Tongues.......... 2975
Pipe and Fittings, Barrel Track Made of 2995
Pipe and Fittings, Shop Ladder Made of 2973
Pipe and Wire Netting, Portable Baseball Backstop Built of 2981
Pipe Bracket, One Piece, of Strap Iron.. 3081
Pipe Connection, Emergency, Roofing Paper as 2984
Pipe Connection to Flue, Riveted Stop Collar for 3081
Pipe Cutter Marks Round Stock for Sawing 2994
Pipe, Iron, Strong Gate Built of 3064
Pipe, Jig for Drilling Holes in........ 3074
Pipe Joints, Device for Setting Gaskets in 3083
Pipe Joints, Tough Cement for.......... 2984
Pipe, Large, Spider for Cutting in Lathe 2956
Pipe, Small or Thin, Cutting Threads Accurately 3020
Pipe Vise, Substitute for 3066
Pipe Wrench Made from Rope and Wooden Strip 3050
Pipes and Cigars, Racks for Aid "No Smoking" Enforcement 3053
Pipes and Fittings, Substantial Power Drill Press Made of 3039
Pipes, Bars, Rods, Adjustable Roller Stand for 3032
Pipes, Cold Water, Painting 2921
Pipes, Long, Handling in Small Shops.. 2892
Pipes or Cylinders, Large Cement Bandage Repair on..................... 3031
Pipes, Pressure, Soapy Water on, Locates Leaks at Joints 3069
Pipes, Rods and, Stock Racks for, Quickly Devised 3005
Pipes, Water, Hot Air Heater Protects from Cold 3036
Piston Ring, Beveled, Overcomes Excess Oil in Cylinders 2957
Piston Ring Grooves, Scraping Dirt from 3002
Piston Rings, Gasoline Motor, Fitting Accurately 3016
Piston Rings, Handy Plier Vise Used on 2953
Piston Rings, Oversize, Device for Grinding by Hand................... 3085
Piston Rings, Tool for Fitting 2997
Piston Washers, Cupped Leather Making 2890
Pit, Scale, Keeping Dirt Out of 2913
Pitch, Diametral, of Gears, Gauge Determines 2976
Plane, Groove, Small, Made from Steel Strip 3069
Plane, Rabbet, Homemade............ 2972
Plants, Fumigating with Tobacco Smoke 2930
Plaster Molds, Wax Patterns for Making 2901
Plaster of Paris Sprinkled in Water, Yields Smooth Mixture 2968
Plaster, Preventing Breaking of, by Door Knobs 2893
Plate, Frying, Nonwarping for, Electric Stove 2937
Platens, Typewriter, Surfacing with Sandpaper 3026
Platform Scale Inclines to Save Lifting 2963
Playhouse, Garage Roof as 2904
Plier, Foot Lever Wire Cutter Made of 2904
Plier Vise, Handy, Used on Piston Rings 2953
Pliers, Cutting, for Tool Room.......... 2910
Plugs, Spark, Stock of Kept Safely in Racks 3070
Plumb Bob, Drop, of Weighted Tubing. 2944
Plumb Line, Coat Button Takes Up Slack in 3068
Pocket in Front Cover of School Book is Convenient 2959
Pockets on Switchboards for Memos of Special Calls 2991
Poison, Washer on Neck of Bottle Containing 2898
Polarity of Line Wires, Methods of Testing 3087
Pole, Oilcan Mounted on, for Oiling Overhead Bearings 3091
Poles, Substantial and Economical Concrete Base for 3063
Polishing Rooms, Testing Atmosphere in 2924
Porcelain Insulators, Cutting.......... 2892
Portable Baseball Backstop Built of Pipe and Wire Netting............. 2981
Portable Lamp Standard, High, for Shop Lighting 2986
Portable Stand for Janitor's Cleaning Equipment 3020
Portable Tool Rack for Mill Room Aids in Checking Up Tools 3041
Post Cards, Mask for Small Negatives Printed on 3074
Post Extractor Mounted on Wheels 3057
Post Hole Auger, Two Shovels Used as.. 2903
Posts, Piling or, Hook for Removing Cap Rings from 3026
Posts, Wooden, Renewing with Concrete 3013
Poultry Feeder, Automatic, with Clock Control 2979

Power Hoist, Homemade, for Loading Hay 2943
Power Plant, Auto Used as, without Altering Car 3052
Power Plant Tractor, Small, Made of Engine and Mower........ 2965
Press, Paper Baling, Homemade 3034
Press, Sandpaper Finger Tips Aid in Feeding 3059
Pressure Pipes, Soapy Water on, Locates Leaks at Joints........ 3069
Printing Machine, Letter, Proof on, Made with Carbon Sheet........ 3026
Printing Machine, List, for Use with Rubber Type 2932
Printing Press Gauge Pins Made of Paper 3052
Prints, Core, Simple Method of Making without Lathe 3018
Prints, Photo, Corrugated Cardboard Convenient Drier for 2914
Prints, Photo, Sink in Wash Water if Forced in Development 2927
Proof on Letter Printing Machine Made with Carbon Sheet 3026
Puddle, Hinged Tread Covers at Worn Doorstep 2996
Pulley, Belt Laces Not Crossed on Side Placed against 3068
Pulley Lever That Does Not Damage Rims 3017
Pulling Hook with Safety Finger Hold 3054
Pump, Air, Stuffing Box, Repair for.... 3007
Pump, Bronze Disk Takes Up Thrust Wear in 3051
Pump, Drainage, Improvised on Job.... 3048
Pump, Temporary, for Cooling Gas Engine Water Jacket........ 2959
Punch, Compressed Air, for Cutting Washers 2917
Punches, Marking, Holder Strapped to Workman's Belt 3062
Punctures, Small Tire Tube, Repairing.. 2929
Putty for Glazing Contains White Lead 2916

Rabbet Plane, Homemade 2972
Rabbeting and Grooving Tool of Wide Use 3090
Rack and Case for Sterilizing Shop Goggles 2935
Rack, Convenient, for Drying Laboratory Glassware 3092
Rack Disassembling, Keeps Engine Parts in Order 3040
Rack, for Washing Vegetables........ 2903
Rack, Portable Tool, for Mill Room Aids in Checking up Tools 3041
Rack Safeguards Surveyor's Instruments 2947
Rack, Trolley Tool, Laboratory or Shop 2893
Rack, Washing, for Blueprints........ 2979
Racks for Pipes and Cigars Aid "No Smoking" Enforcement 3053
Racks, Stock, for Rods and Pipes Quickly Devised 3005
Racks, Stock of Spark Plugs Kept Safely in 3070
Radiator, Auto, Electric Pad Warms in Garage 2912
Radiator, Steam, Valve Frees of Air Quickly 3069
Radiators, Auto, Tool for Soldering..... 2952
Rail, Orchestra Pit, Used as Speaking Tube 2923
Railroad Car Doors, Emergency Sash for 2953
Railroad Tracks, Handcart for........ 3007
Rail Joints, Motor Driven Grinder for... 3076
Rainwater, Chipped Grooves Drain from Walk 3023
Ram, Hydraulic, Homemade........ 2971
Razor Blade, Safety, Device for Scraping Paper from Glass 2978
Reamer, Large, Repairing........ 2946
Reamer, Reaming Bushing on Collar without 2948
Recorder, Operation, Electric with Remote Control 3082
Reflector for Floodlighting Construction Work 2912
Refrigerator, Homemade, at Small Cost 2905
Reel, Roller Bearing, for Electrical or Other Wire 2959
Refuse Can, Sanitary, Shop, with Pedal Control Lid 3038
Reinforcing Light Wooden Triple Arch 2936
Release Weight, Electric, Fire or Warning Whistle Operated by........ 3008
Remover and Wall Receptacle for Bottle Caps 2957
Repair, Cement Bandage, on Large Pipes or Cylinders 3031
Repair Work, Ladder with Wheelbarrow Fixture for 3077
Reproduction, Blueprint, Typewriting on Tracing Paper for........ 2982
Resawing Device for Band Saw........ 3071
Revolution Counter, Rigged to Determine Lineal Travel on Machinery.... 3014
Revolving Check Holder for Lunch Rooms 3053
Revolving File Cabinet on Double Desk Saves Time 2973
Revolving Nail Holder Made from Cheese Box 3059
Rheostat Made from Old Arc Lamp Carbons 2976
Rifle Sight, Old, Builder's Survey Level Made from 2992
Rims, Pulley Lever That Does Not Damage 3017
Rings, Piston, Oversize, Device for Grinding by Hand........ 3085
Rings, Piston, Tool for Fitting........ 2997
Rings, Special Bobbin for Winding Wire on 3092
Ripsaw Cuts Large Nail without Injury 2994
Rivet, Setting Handily in Awkward Place 2998
Rivets and Small Hardware, Wall Pockets for Storing 3025
Rivets, Hidden Screw, for Woodwork... 2950
Road, Barrel Sprinkler for Oiling........ 2950
Road, Strike Board for Tamping and Crowning 2940
Roadster, Automobile, Double Hood.... 2897
Robe Rack, Folding Table, and Extra Compartment in Automobile........ 3015
Rock or Gravel Chute, Deflector for Bottom of 3037
Rodents, Preventing from Entering Drain or Sewer Outlets........ 3065
Rods and Pipes, Stock Racks for Quickly Devised 3005
Rods, Brads Hold on Small Patterns.... 2907
Rods, Pile of Protected by Painted Stripe 3018
Rods, Pipes, Bars, Adjustable Roller Stand for 3032
Roll of Several Layers, Winding at Once 3037
Roll, Paper Box, Blue Print and, with Sheet Cutter 2968
Roller Bearing Reel, for Electrical or Other Wire 2959
Roller, Raised Letters and Designs Painted with 3001
Roller Skate Truck Saves Carrying Doors and Sash........ 3005
Roller Stand, Adjustable, for Pipes, Bars and Rod 3032
Rollers, Garden Hose, for Graining Woodwork 2910
Roof, Garage, as Playhouse........ 2904
Roof, Ventilating Door on, Opened from Ground 3018
Roofing Paper as Emergency Pipe Connection 2981
Room, Converted Sleeping, Weather Curtain for 2895
Rooms, Lunch, Revolving Check Holder for 3053
Rooms, Polishing, Testing Atmosphere in 2924
Rope and Wooden Strip, Pipe Wrench Made from 3050
Ropes Fed through Floor from Basement Stock Room 2956
Rubber Band, Weight of Goggles Relieved by 3000
Rubber Goods Kept Pliable by Oil...... 3012
Rubber Type, List Printing Machine for Use with 2932
Rule, Folding, Oil on Facilitates Use... 2953
Rule or Straightedge, Adjustable Gauge for 3094
Ruler, Parallel, Glass Rod Used as..... 2917
Ruling Pen, Comb Used as........ 2935
Ruling Pen, Ink Handily Transferred to 2996
Runabout, Fast Nineteen Foot, Building 2887

Runway over Oil Tanks Saves Lifting of Barrels 3051
Rust, Preventing on Auto Fenders 2910
Rut, Makeshift Method of Lifting Auto Truck Out of 3078

Safety, Electric Switch Mounted on Ceiling for 3088
Safety Finger Hold, Pulling Hook with 3054
Safety Gas Cock with Ball Valve 3009
Safety Guard for Exposed Shafting 2922
Safety Mirror Attached to Automobile Mudguard 2994
Safety Pins, Small Cutters or Dies Kept on 2898
Safety Window Cleaning Seat 2942
Salt Shaker, Aluminum, Made into Lens Holder 3033
Sandpaper Finger Tips Aid in Feeding Press 3059
Sandpaper, Surfacing Typewriter Platens with 3026
Sanitary Drinking Fountain of Concrete 3003
Sanitary Shields for Shop Cuspidors 2989
Sash and Doors, Roller Skate Truck Saves Carrying 3005
Sash, Emergency, for Railroad Car Doors 2953
Satchel, Money, Novel Method of Strapping to Messenger 3046
Saw, Band, Resawing Device for 3071
Saw, Circular, Cutting Floor Openings with 2984
Saw, Circular, Guide for Cutting Triangular Strips on 3002
Saw, Circular, Molding Head for 2934
Saw Guard, Circular, Safety, Prevents Back Thrust 3014
Saw, Hand, Depth Gauge on 2933
Saw Setting, Hammer and Anvil 2903
Saws, Hand and Circular, Vise for Filing 3073
Saws, Old, Provide Good Stock for Tools 3033
Sawdust Foundation Levels Floor Linoleum 2940
Sawhorse, General Utility 2893
Sawhorse, Tool Kit 2913
Sawing, Pipe Cutter Marks Round Stock for 2994
Sawing, Turning, and Grinding Machine, Combination 3011
School Book, Pocket in Front Cover is Convenient 2959
Scale, Locking, Caliper with 2928
Scale Pit, Keeping Dirt Out 2913
Scale, Platform, Inclines to Save Lifting 2963
Scissors, Cutting Hard Sheet Rubber with 3022
Scissors, Pair of, Used as Envelope Sealer 2936
Scoop, Hand, Strong, Drip Pan Made of 3093
Scooter, Ice Boat, Aeroplane and 3042
Scraper Safety Razor Blade Device for Scraping Paper from Glass 2978
Screw Clamps, Leather Wrench for Tightening 3006
Screw Rivets, Hidden, for Woodwork 2950
Screw Threads, Rigging for Grinding 2988
Screws, Device for Holding while Threading Them 2976
Screws, Eyeglass, Device Prevents Loosening of 2978
Screws, Wooden Expansion Plugs for, Easily Made 3052
Screwdriver, Toothed End Prevents from Slipping 2952
Sealer, Envelope, Pair Scissors Used as 2936
Seat, Safety Window Cleaning 2942
Self Opening Garage Door 2954
Setscrews and Nuts, Ordinary, Collar Setscrews Made from 3046
Sewer Outlets, Drain or, Preventing Rodents from Entering 3065
Shade, Revolving, Window Lamp with, Attracts Attention 3022
Shades Electric Light Bulbs Painted Black as Substitute for 3092
Shaft Coupling, Quickly Made 3025
Shaft Hangers and Fittings for Small Shop 3021
Shafts, Moderate and High Speed, Bearings of 2950
Shafting and Machinery Alining Tool for 3065
Shafting, Exposed, Safety Guard for 2922
Shafting, Jig for Drilling Holes at Ends of 2913
Shafting, Machine, Fans on, Cool Workmen 2948
Shafting, Overhead, Polishing 3046
Sharpener, Pencil, with V-Groove Made from Files 2972
Shear of Angle Iron for Vise 2974
Sheave Made from Iron Washers in Emergency 3069
Sheet Brass, Inclose in Large Wrought Iron Pipe When Annealing 3080
Sheet Cutter, Blueprint and Roll Paper Box with 2968
Sheet Fiber, Bamboo and, Hollow Drill for Boring 3066
Sheet Metal Bench Dog, Handy 2964
Sheet Metal, Makeshift Tool Cuts Round Holes in 3085
Sheet Metal, Removing Dents from Auto Fenders or 2955
Sheet Metal, Soldering Machine Nut to 2916
Sheet Metal Work, Small Floor Pit Convenient for 3050
Sheet Rubber, Hard, Cutting with Scissors 3022
Sheets, Drafting, Cut Quickly from Roll of Paper 3058
Shelf, Dash, for Order Books on Auto 2944
Shelf, Folding, for Small Objects, Photographic Background with 3093
Shellac, Carburetor Floats, Used with Gasoline May be Varnished with 3036
Shellac, Leather Pattern Fillets Set in 2907
Shelving, Steel, Test of for Deflection 2918
Shield, Erasing, Adjustable to Various Lines 2936
Shields, Sanitary, for Shop Cuspidors 2989
Shift Key, Knee Lever Actuates, on Typewriter 3049
Shingles Set by Gauge on Shingling Hatchet 3030
Shingling Hatchet, Shingles Set by Gauge in 3030
Ship, Mystery Sailing, as Window Display 2989
Shipbuilding Material, Cableway for Handling 2902
Shoe Guard for Shovel 3085
Shoe Polish, Liquid, Used as Auto Radiator Paint 3062
Shop Bin Economizes Short Lengths of Steel 2947
Shop Cuspidors, Sanitary Shields for 2989
Shop Desk, Raising Increases Its Usefulness 2986
Shop Device for Addition of Fractions 2954
Shop Goggles, Rack and Case for Sterilizing 2935
Shop Ladder Made of Pipe and Fittings 2973
Shop Lighting, Portable Lamp, High Standard for 2980
Shop or Garage, Large Grease Gun for 2938
Shop or Laboratory, Trolley Rack for 2893
Shop Order Box Saves Time of Workmen 2899
Shop Refuse Can, Sanitary, with Pedal Control Lid 3038
Shop, Small, Shaft Hangers and Fittings for 3021
Shop Tally Cards, Tin and Celluloid Cover Protects 3062
Shops, Small, Handling Long Pipes in 2892
Shot, Bag of, Spark Plugs Cleaned with 2988
Shoulder, Eyeshade Safely Carried Under 2967
Shovel, Shoe Guard for 3085
Shovels, Two, Used as Post Hole Auger 2903
Sideboard, Old, Artist's Cabinet Made from 2960
Sights from Old Rifle, Builder's Survey Level with 2992
Sign, Color Changing, Inexpensive 2977
Sign, Danger, for Unsafe Grinding Wheel 2913
Sign, Will Be Back, Variable, Quickly Made 3023
Signs, Cloth, Quick Drying Paint for 2919
Signal, Bell, Calls Automatic Machine Operator 2963
Sink for Washing Blueprints 2891
Sink Stoppers, Rubber Covered Instrument Knobs Made from 3050

Sketches, Ink Preliminary, Drafting, Prove Economical and Convenient 3076
Skimmer for Removing Slag from Molten Metal 2948
Slag, Skimmer for Removing from Molten Metal 2948
Sled, Boat, Aero Propelled 3042
Sleeping Room, Converted, Weather Curtain for 2895
Sliding Base, Structural Steel, for Motors and Machinery 2945
Sliding Caliper, Special, Useful on Many Jobs 3049
Slip Gear Minimizes Breakage of Teeth 3041
Slip Stones, Holder for 2892
Slipping of Belt, Canvas Overcomes 2931
Smoke, Tobacco, Fumigating Plants with 2930
Smokestack, Iron, Blown Down, Reinforcing 2973
Snow, House Moved Over with Makeshift Capstan 3051
Snowfall, Heavy, Gate Adjustable to 3001
Soap Used in Bag Improves Auto Washing 3077
Soapsuds Reduces Carbon Deposit in Compressor 2894
Socket Wrench, Adaptable 3038
Socket Wrench, Flexible 2916
Soldering Furnace, Improved Charcoal. 2006
Soldering Granite Ware, Simple Method of 3040
Soldering Iron, Bushing in Handle of 2947
Soldering Iron, Improved for Joining Splices 3094
Soldering Iron, Smooth, Transmits More Heat 2923
Soldering Machine Nut to Sheet Metal 2916
Spark Plugs Cleaned with Bag of Shot 2988
Spark Plugs, Stock of, Kept Safely in Racks 3070
Speaking Tube, Orchestra Pit Rail Used as 2923
Spectacles, Magnifying Eyeglass Fitted with 3069
Speed, Hydroplane Catamaran Built for 2925
Speed Indicator Counts Turns on Wire Coil 2977
Speeds, Automobile, Formula for Calculating 2899
Spider for Cutting Large Pipe in Lathe 2956
Spindle, Drill Press, Babbitting Drill in Avoids Heavy Work 3062
Spindles, Small, Steel Roller Lathe Dog for Making 2966
Splices, Soldering Iron Improved for Joining 3094
Spool, Cut at Middle, Provides Two Knobs 2891
Spot Welding Machine, Electric 3027
Spotlight, Auto, Electric, Arranged for Easy Focusing 3064
Sprayer, Garden, of Varied Uses 2918
Spring Clip Locks Rolled Measuring Tape 3081
Spring Steel Strap, Brake Band Repaired with 3050
Springs, Auto, Proper Care of 2931
Springs, Auto, Simple Device for Lubricating 3032
Sprinkler, Barrel, for Oiling Road 2950
Sprocket, Bicycle, Boat's Wheel Made from 2910
Spruce, Japanese Finish for 2917
Stair Tread, Hinged, Electric Switch Controlled by 2938
Stakes, Marking, Wedge Shaped, Prove Superior 2990
Stand for Stacking Irregular Castings 2898
Stand, Janitor's, Portable, for Cleaning Equipment 3020
Stand Quickly Made for Lathing 2922
Stand, Valve and, for Inflating Tires Quickly 2919
Standard, High Portable Lamp, for Shop Lighting 2980
Standard Shapes, Time Saved in Drafting Duplicate Parts by Marking 2944
Starters, and Generators, Automobile, Locating Trouble in 2922
Starting Handle for Small Gas Engine 3008
Steam, Measuring Velocity of 2998
Steam, Muffler for Injecting into Water Tank 3061
Steel Columns, Old, Reinforced by Concrete Casing 2994
Steel, High Speed, Tool Holder for 2927
Steel Roller Lathe Dog for Making Small Spindles 2966
Steel, Shop Bin Economizes Short Lengths of 2947
Steel Strip, Small Groove Plane Made from 3069
Stencil, Wire Gauze 2993
Stencils, Curved and Straight, Using 3014
Steps, Collapsible, for Boarding Boat 2919
Stereopticon Lanterns, Incandescent Lamps Used in 2949
Stereotyping without Special Apparatus 2996
Stick, Pill Box on, Engine Nut Recovered with 2971
Stock Racks for Rods and Pipes Quickly Devised 3005
Stock Room, Basement, Ropes Fed through Floor from 2956
Stock Room, Lamps for, Shifted Along Horizontal Wires 3049
Stock, Round, Counterbore Ground Quickly from 3032
Stock, Round, Pipe Cutter Marks for Sawing 2994
Stokers' Boiler Furnace Inspection Glass 2953
Stool, Metal, Cushion Seat Folding 2955
Stop Collar, Riveted, for Pipe Connection to Flue 3081
Stop, Hinge and, Combined, for Cellar Doors 3026
Storage Battery, Carrying Tool Box in 2900
Storage Batteries, Device Aids in Filling 3057
Storage Cellar, Round, for Farm 3031
Stove, Charcoal Heating, Made of Flowerpots 2976
Stove Damper, Device for Opening Handily 3022
Stove, Electric, Nonwarping Frying Plate for 2937
Storing Mica Washers without Damage, Tray for 2936
Stove Lid Lifting Lug Repaired with Wire 3051
Stove Lid Used to Repair Forge 2972
Straightedge, Rule or, Adjustable Gauge for 3094
Strap, Foot Pressure, Aid in Filing 3091
Strap, Spring Steel, Brake Band Repaired with 3050
Stream, Measuring the Velocity of 2998
Street Car Gongs, Old, Used as Hardware Trays 2969
Strike Board for Tamping and Crowning Road 2940
Strings or Cords, Short, Bundle of, Bound, Used as Brush or Swab 2899
Strip, Steel, Small Groove Plane Made from 3069
Strips, Iron, Bent Cold, Blacksmith's Tongs Made of 3046
Strips, Triangular, Guide for Cutting on Circular Saw 3002
Stripe, Painted, Pile of Rods Protected by 3018
Strop, Whetstone and, Kept Handily in Bench Drawer 2964
Structural Steel Sliding Base for Motors and Machinery 2945
Stud Bolts, Heavy, Removed with Lathe Dog and Lever 3091
Stuffing Box, Air Pump, Repair for 3007
Stump Boring Machine, Homemade, Aid to Settlers 3055
Submarine Chase in Display Window 2961
Support for Long Work in Vise 2919
Support, Traveling Pulley-and-Hanger, at Anvil 2923
Surface, Rough, Wire Mesh to Make, for Concrete Walk 2973
Surface, Working, Good, Drafting Table Covered with Heavy Paper Has 2997
Surfacing Typewriter Platens with Sandpaper 3026
Surgery—Headlight as Emergency Lamp for Operating Room 2891
Survey Level, Builder's, with Sights from Old Rifle 2992

Surveyor's Instruments, Rack Safeguards 2947
Surveyor's Level Repair for Broken Cross Hairs in.... 3061
Swab, Brush or, Bundle of Short Strings or Cords, Bound, Used as.... 2899
Sweepings, Chips and, Can for Recovering Oil from 2964
Swine Cafeteria in Barrel 2992
Switch, Electric, Controlled by Hinged Stair Tread 2938
Switch, Electric, Mounted on Ceiling for Safety 3088
Switch, Knife, Metal Case with External Control for 3033
Switchboards, Pockets on for Memos of Special Calls 2991

T-Square, Attachment Keeps Rigid on Board 3071
T-Square, Brass Guide Strip for.... 2972
Table, Apple Packing, Mounted on Wheels 2975
Table, Case at End of, for Blueprint or Drafting Paper Rolls.... 3086
Table, Drafting, Covered with Heavy Paper Has Good Working Surface... 2997
Table, Drill Press, Supports Tool Tray.. 3008
Table, Folding, Robe Rack and Extra Compartment in Automobile 3015
Table for Mounting Drawings on Muslin or Backing 2914
Table Frame, Strong, Quickly Made... 3059
Tackle for Hoisting Heavy Barrels.... 3036
Tally Cards, Shop, Tin and Celluloid Cover Protects 3062
Tank, Cold Water, Paraffin Repairs Small Holes in.... 3063
Tank Filler Cap, Square Wrench Seat Fitted on 3052
Tank, Gasoline, Special Outlet on Provides Reserve Supply 3077
Tank, Water Muffler for Injecting Steam into 3061
Tanks, Oil, Runway over, Saves Lifting Barrels 3051
Tap That Binds Must be Removed.... 3004
Tapeline, Broken, Rapid and Accurate Repair of 2955
Tapeline, Handy One Man Method of Using 3054
Tapping Small Machine Parts, Device for 2928
Teeth, Broken, Repairing in Fiber or Paper Gears 2955
Teeth, Pencil Held to Detects Knocks in Inclosed Machine 3048
Teeth, Slip Gear Minimizes Breakage of 3041
Telephony—Pockets on Switchboards for Memos of Special Calls.... 2991
Template, Wrench, Saves Draftsman's Time 3066
Tension Key, Machinery, Cementing Gaps around 2943
Terminal Boxes, Clip Holds Door of, during Tests 2979
Test Box for Electrical Fuse Cartridges 3041
Thread, Loose Wooden, Making Fit Tightly 2896
Threads, Cutting Accurately on Small or Thin Pipe.... 3020
Thrust in Gear Shaft, Ball Bearings Overcome 2929
Thrust Wear in Pump, Bronze Disk Takes Up 3051
Thumb Nuts, Worn Brass, Hammering Tightens 2954
Tickler for Priming Carburetor.... 3063
Tile, Drain, Method of Handling.... 2909
Tile, Hollow, Wall Construction, Using Metal Bonds for.... 2968
Tile Machine, Concrete, Homemade.... 2895
Timekeeping Clock, Shop, Decimal Dial on 2913
Time Saving—Drafting Duplicate Parts by Marking Standard Shapes.... 2944
Time Saving—Large Wheelbarrow in Cleaning Wood Shops 2978
Time Saving—Revolving File Cabinet on Double Desk 2973
Time Saving—Shop Order Box Saves Workmen 2899
Time Saving—Soldering Wrought Iron Rings by Dipping.... 2991
Time Saving—Wrench Template Saves Draftsman's Time 3066
Tin on Ax Handle Saves Wear.... 2949
Tip Boxes Measure Concrete Materials Economically 3080
Tipping Cradle for Carboys.... 2993
Tire Economy, Automobile, Suggestions on 2980
Tire Fabric, Device for Cutting, on Bias 2892
Tire Tube Punctures, Small, Repairing.. 2929
Tires, Auto, Pointers on the Care of.. 2974
Tires, Valve and Stand for Inflating Quickly 2949
Tongs, Blacksmith's, Made of Iron Strips Bent Cold 3046
Tonneau, Auto, Foot Rest Locker Built into 3010
Tool, Adaptable, for Machining Circular Curves on Lathe.... 3016
Tool, Alining, for Shafting and Machinery 3065
Tool Box, Carrying Storage Battery in.. 2900
Tool Chest and Trestle, Combination, Folds Compactly 3060
Tool for Applying Hose Clamps Handily in Vise 3014
Tool for Fitting Piston Rings.... 2997
Tool for Grasping Small Machine Parts 3020
Tool for Soldering Automobile Radiators 2952
Tool, Hand, for Making Mortise-and-Tenon Joints 2960
Tool Handles, Small, Old Paint Brushes Provide 3052
Tool Holder for High Speed Steel.... 2927
Tool Kit, Sawhorse.... 2913
Tool, Makeshift, Cuts Round Holes in Sheet Metal 3088
Tool, Rabbeting and Grooving, of Wide Use 3090
Tool Rack, Portable, for Mill Room Aids in Checking Up Tools 3041
Tool Rack, Trolley, for Shop or Laboratory 2893
Tool Room, Cutting Pliers for.... 2910
Tool Tray, Drill Press Table Supports.. 3008
Tool, Wire Skinning, of Handy Size.. 3066
Tools, Old Saws Provide Good Stock for 3033
Tools, Portable Tool Rack for Mill Room Aids in Checking Up.... 3041
Tools, Wood Turning, Holder for.... 2956
Torch, Blowpipe, Small, without Compressed Air 3068
Torch for Burning Off Old Paint.... 2993
Tracing Paper, Typewriting on, for Blueprint Reproduction 2982
Tracks, Railroad, Handcart for.... 3007
Tractor, Small Power Plant, Made of Engine and Mower 2965
Traveling Crane for Farm.... 2983
Traveling Pulley and Angle Support at Anvil 2923
Tray, Tool, Drill Press Table Supports 3008
Tray for Storing Mica Washers without Damage 2936
Trays, Hardware, Old Street Car Gongs Used as 2969
Tread, Hinged, Covers Puddle at Worn Doorstep 2996
Trestle, Combination Tool Chest and, Folds Compactly 3060
Triangle Holder Aids in Inking Drawings 2923
Triangles, Crosshatching Prevents Slipping on Drafting Board.... 2979
Triangular Strips on Circular Saw, Guide for Cutting 3002
Trolley, Cable, Rides Over Guy Wires in Its Path 2999
Trolley Tool Rack for Shop or Laboratory 2893
Trouble, Locating, in Automobile Starters and Generators.... 2922
Troughs, Flumes or, Concrete Liners Overcome Wear at Turns in.... 3038
Truck, Auto, Makeshift Method of Lifting Out of Rut.... 3078
Truck, Barrel, Made of Pipe and Fittings 2995
Truck, Barrow, Pivoted Rear Caster Improves 3037
Truck for Canoe or Small Boat.... 2983
Truck, Roller Skate, Saves Carrying Doors and Sash 3005

Trucks, Handle Forms Coupler for Train of 2930
Tube and Water Level Indicator, Homemade 3086
Tube or Bottle, Glass, Cutting 2972
Tube, Speaking, Orchestra Pit Rail Used 2923
Tubing or Rods, Polished, Vise Pads for 2916
Tubing, Weighted, Drop Plumb Bob of 2944
Turning, Sawing, and Grinding Machine, Combination 3011
Turns, Speed Indicator Counts on Wire Coils 2977
Turntable for Small Garage 3079
Type, Rubber, List Printing Machine for Use with 2932
Typewriter—Typewriting on Tracing Paper for Blueprint Reproduction 2982
Typewriter, Knee Lever Actuates Shift Key on 3049
Typewriter Platens, Preventing from Becoming Grooved 2980
Typewriter Platens, Surfacing with Sandpaper 3026

U-Bolts, Practical Uses for, and Rig for Forming Them 3090
Undercutting Mica on Commutators, Device for 2969
Universal Chuck, Damaged, Repairing .. 2896

V-Groove, Pencil Sharpener with Made from Files 2972
Vacuum Cleaner, Wire Protective Screen Increases Usefulness of 2995
Valve and Stand for Inflating Tires Quickly 2949
Valve, Angle, Low Pressure, Homemade 3002
Valve, Auto Engine, Loose, Leather Cap Remedies 3054
Valve Frees Steam Radiator of Air Quickly 3069
Valves, Pointers on Use of 2969
Varnish, First Coat, Benzine in Prevents "Crawling" 2987
Vegetables, Rack for Washing 2903
Vehicles, Motor, Grade Indicator for 2966
Ventilation—Ventilating Door on Roof Opened from Ground 3018
Ventilator, Double Hood, Draws Fumes Away Quickly 2940
Vise for Filing Hand and Circular Saws 3073
Vise, Gripping Jaw Device for 3045
Vise, Handy Plier Used on Piston Rings 2953
Vise Pads for Polished Tubing or Rods 2916
Vise, Pipe, Substitute for 3066
Vise, Plier, Handy, Used on Piston Rings 2953
Vise, Support for Long Work in 2919
Vise, Shear of Angle Iron for 2974
Vise, Tool for Applying Hose Clamps Handily in 3014
Vulcanized Joint, Attaching Hose Coupling with 3010

Walk, Chipped Grooves Drain Rainwater from 3023
Walk, Concrete, Wire Mesh for Rough Surfacing 2973
Walks, Concrete Borders on Protect Grassplots 3059
Wall Construction, Hollow Tile, Using Metal Bonds 2968
Wall Pockets for Storing Rivets and Small Hardware 3025
Wall Receptacle, Remover and, for Bottle Caps 2957
Wardrobe, Canvas Covered, Protects Workmen's Clothes 2982
Warning Gong, Automatic, for Vehicles 3089
Warning Gong System for Freight Elevators 2984
Warning Horn at Sidewalk Garage Door 2943
Washbasin and Concrete, Charcoal Forge Made of 2963
Washbasin Faucets, Pedal Controls for 3001
Washer Holds Bolt from Turning in Clamping Groove 2952
Washer on Handle of Brush Used in Overhead Work 2904
Washer on Neck of Bottle Containing Poison 2898
Washer, Thin, Filing Down 2946
Washers, Angle Leather, Stop Oil Leakage in Crank Case 3031
Washers, Compressed Air Punch for Cutting 2917
Washers, Hard Sheet Rubber, Punching by Hand 2926
Washers, Iron, Sheave Made from, in Emergency 3069
Washers, Metal, Thin, Cutting by Hand 2998
Washers, Mica, Tray for Storing without Damage 2936
Washers, Piston, Cupped Leather, Making 2890
Washing Bottles, Chuck on Emery Grinder Used for 2991
Washing Vegetables, Rack for 2903
Water and Feed Heater, Farm, of Concrete 3016
Water and Tube Level Indicator, Homemade 3086
Water Barrels, Casters on Promote Fire Protection 3074
Water Filter, Barrel 2908
Water Hose, Device for Repairing 2904
Water Jacket, Air Pumped through Cools Gasoline Motor 3000
Water Jacket, Gas Engine, Temporary Pump for Cooling 2959
Water Level Indicator, High and Low ... 2928
Water, Muriatic Acid in Restores Gold Leaf 2936
Water Pipes, Hot Air Heater Protects from Cold 3036
Water, Plaster of Paris Sprinkled in Yields Smooth Mixture 2968
Water, Soapy, on Pressure Pipes Locates Leaks at Joints 3069
Water, Stream of, Blast for Forge from 2990
Water Tank, Cold, Paraffin Repairs Small Holes in 3063
Water Tank, Muffler for Injecting Steam into 3061
Water Tank, Small, Repairing Hole in 2990
Wax Patterns for Making Plaster Molds 2901
Wax Prevents Cleats from Sticking 2911
Weather Curtain for Converted Sleeping Room 2895
Weather Proof Light Fixture, Cheaply Made 3076
Weight, Counting Small Parts by 2967
Weights, Paper, Padded and Flexible .. 2927
Welding Machine, Spot, Electric 3027
Wheel Arrangement for Drying Blueprints 3057
Wheel, Boat's, Made from Bicycle Sprocket 2910
Wheel, Large, Refaced on Lathe Rigged as Grinder 3009
Wheel, Unsafe Grinding, Danger Sign for 2913
Wheelbarrow Fixture, Ladder with, for Repair Work 3077
Wheelbarrow, Large, Saves Time in Cleaning Work Shop 2978
Whetstone and Strop Kept Handily in Bench Drawer 2961
Whistle, Fire or Warning, Operated by Electric Release Weight 3008
Winch, Grinder as, for Hoisting Countershaft 2970
Windlass, Compressed Air Motor Drill Operates 2940
Window Cleaning Seat, Safety 2942
Window Display—Air Scouting over Battlefields 3071
Window Display, Moving Hand Draws Attention to 3048
Window Display, Mystery Sailing Ship as 2989
Window, Display, Submarine Chase in .. 2961
Window Lamp with Revolving Shade Attracts Attention 3022
Window, Novel Display Wheel for 3025
Window, Safety, Cleaning Seat 2942
Winter Touring, Devices That Add Comfort to 3023
Wire Across Lamp Relights Acetylene Flame 2984
Wire Coil, Speed Indicator Counts Turns on 2977
Wire Cutter, Foot Lever, Made of Plier 2904
Wire, Electrical or Other, Roller Bearing Reel for 2959
Wire, Fence, Device for Tightening ... 2919
Wire Gauze Stencil 2993
Wire, Heavy, Soldering Joints in 3068

Wire Mesh, Device for Unrolling and Measuring Handily 2996
Wire Mesh for Rough Surfacing Concrete Walk 2973
Wire Netting, Pipe and, Portable Baseball Backstop Built of............... 2981
Wire, Roller Bearing Reel for Electrical or Other 2959
Wire Scratch Brush, Small, Handy in Soldering 3021
Wire Screen, Protective, Increases Usefulness of Vacuum Cleaner 2995
Wire Skinning Tool of Handy Size 3066
Wire, Special Bobbin for Winding on Rings 3092
Wire, Stove Lid Lifting Lug Repaired with 3054
Wire Tools for Laboratory and Workshop, Homemade 3070
Wire, Woven, Novel Foot Bridge of... 2988
Wires Hinged Insulator Brackets Prevent Breakage by Swaying.......... 3000
Wires, Horizontal, Lamp for Stock Room Shifted Along 3049
Wires, Line, Methods of Testing Polarity of 3087
Wood—Oak Easily Spotted by Machine Oil 2974
Wood—Japanese Finish for Spruce...... 2917
Wood, Bare, Gilding on 3091
Wood Finish Polished Black........... 2920
Wood Finishing Materials, Paper Drinking Cups as Containers 2930
Wood in Lathe, Back Rest for Supporting 3013
Wood Turning Tools, Holder for 2956
Wooden Clamps, Refacing Jaws of...... 3010
Wooden Posts Renewing with Concrete 3013
Woodshop, Small Magnet Useful in..... 3037
Woodwork, Garden Hose Rollers for Graining 2910
Woodwork, Hidden Screw Rivets for.... 2950
Work, Device for Centering, on Boring Mills 3017
Work, Light, Automatic Hammer for... 2962
Work, Long, Support for, in Vise...... 2919
Work, Repair, Ladder with Wheelbarrow Fixture for 3077
Work, Vertical, Notch Gives Three Point Bearing on 2912
Workbench for Use Singly or in Multiple 2924
Workman's Belt, Holder for Marking, Punches Strapped to 3062
Workmen, Fans on Machine Shafting Cool 2948
Workmen, Shop Order Box Saves Time of 2899
Workshop and Laboratory, Homemade, Wire Tools for 3070
Workshop, Small, Heating by Means of Blowtorch 3056
Wrench, Handy, with Drift Pin Handle 2998
Wrench, Leather, for Tightening Screw Clamps 3006
Wrench, Monkey, Used in Drilling Holes in Small Pieces 3054
Wrench Seat, Square, Fitted on Tank Filler Cap 3052
Wrench, Socket, Adaptable to 3038
Wrench, Tap and Reamer, Quickly Made 3073
Wrench Template Saves Draftsman's Time 3066

POPULAR MECHANICS

SHOP NOTES

FOR

1920

EASY WAYS TO DO HARD THINGS

OF DAILY USE
TO EVERY MECHANIC

Vol. XVI—Table of Contents, Pages 3303-3320

POPULAR MECHANICS, CHICAGO

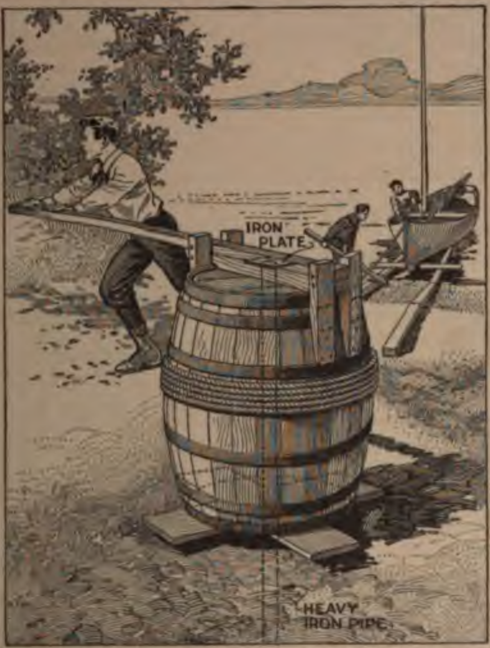
COPYRIGHT, 1920 BY H. H. WINDSOR

Copyright 1920
by
H. H. WINDSOR

Vertical-Drum Windlass Made of Old Barrel

By C. S. GREEN

A PRACTICAL windlass was made to haul a small sailboat from the water, and the method of construction is so simple that many other uses can be found for this type of rigging. The boat was arranged on skids with the usual rollers, and the hauling rope was fastened to the bow, as shown. By steadily winding the rope on the barrel drum, the craft was drawn from the water without danger of damage, and then moved to the desired position on land. In this instance, the heavy iron pipe, on which the drum pivots, was set into the ground. This is a handy method in many cases, but where the windlass is to be shifted from place to place frequently, it is best to set it on a substantial foundation of timber.



A Powerful Windlass can be Rigged Up Quickly with a Barrel as the Drum, and by Providing a Suitable Frame, the Outfit can be Made Suitable for Moving from Job to Job

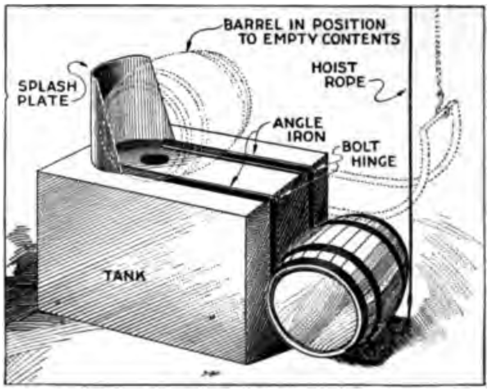
A strong barrel was used, and the bands were set tightly after both heads had been put into place. A cross arm slipped over the iron pipe serves as a bearing at the bottom, and the top of the barrel is reinforced with 2 by 4-in. pieces, as shown. An iron plate caps the upper end of the pipe. The push bar is made to be removed handily. and can be set shorter for use in limited space. When heavy loads are to be handled, an additional push bar on the opposite side can be used.

Accurate Method of Setting Thread Tool in Lathe

A thread tool may be set accurately in a lathe by the following method: Set the lathe centers carefully in their usual position. Turn a cold-rolled steel plug, 1 in. in diameter and the length of the piece to be threaded. Cut a deep groove, the shape of the thread groove to be cut, in the plug, using the tool in the ordinary manner. Then reverse the plug, end for end, and fit the thread tool in the groove. The extent to which the tool is out of alinement is thus shown. The tool is then adjusted about one-half the extreme extent of the error indicated. The groove is next cut slightly deeper with the tool in the new setting, and the plug again reversed on centers. The tool is then fitted into the groove, and the process repeated, if necessary.—F. Shrier, Derby, Conn.

Device for Lifting Barrels to be Emptied

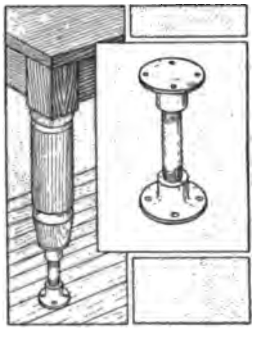
It is found cumbersome to handle heavy barrels of liquid to be poured into an overground tank, and the device shown in the sketch was built so that one man can easily handle the barrels. The barrel is rolled onto the cradle of strap iron and hoisted by means of the tackle. It rolls along the angle-iron ways to the splash plate, where it is emptied. This plate causes the liquid that is splashed around the tank opening to flow back.—Otto Kraft, Chicago, Ill.



Heavy Barrels of Liquid are Handled Easily by One Man with This Arrangement

Adjustable Leg for Table or Bench

For use on floors that are not level, or which have depressions, a table or bench leg that is adjustable is a convenience. One of this type can be made out of pipe fittings, as detailed. A flange is fastened to a suitable length of pipe and the upper flange is set on to give room for adjustment. By the use of a pipe wrench, or other means, the leg is set to the proper height and fastened in place.

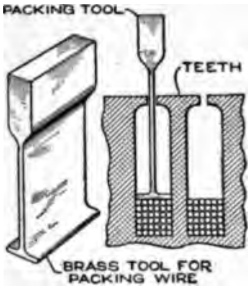


Tin Foil Winding on Bulb Intensifies Electric Light

A handy way of increasing the power of an incandescent lamp which is to be used over a small area is to cover the upper portion of it with a winding of tin foil, held in place with tape. The tin foil acts as a reflector, concentrating the light at the lower end of the bulb and making a shade of the ordinary type unnecessary. This method, resorted to as an emergency kink, proved so successful that its use was continued.—Ernest Schwartz, Brooklyn, N. Y.

Tool for Packing Wires in Slots of Motor Fields

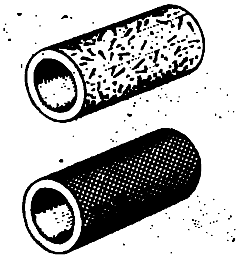
In winding or repairing motors of the type known as "semi-inclosed slot motors," it is necessary to use a special tool to pack the wires tightly. Such a tool must have a thin shank, so that it may be operated through the slit between the teeth, and yet have a flat end to act as a tamper, as shown in the sketch. This tool, nicknamed by most motor-field winders "doodlehoppers," can be made from a brass rod of rectangular cross section, all the work being done with a file. The general shape of the tool is as shown, but the dimensions should be adapted to the work in hand.



Check-Out Board Helps Locate Mechanics in Shop

Shop or office business often takes an employe to another department than his own for a short time. While he is away the foreman, or other official, may want to communicate with him without delay. As an aid in locating absent men, a check-out board is used with success in a large plant Each man in the department has a hook on the board, his name being placed under it. When he leaves the room for another department, he writes the fact on a blank shipping tag and hangs it on his hook. If an employe is absent from business entirely, the cause of his absence and date last at work are written on a card and placed on the board by the shop clerk. Thus by referring to the check-out board a record of the absentees is at hand.

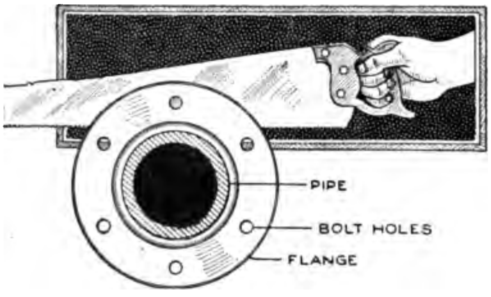
Bushing Fitted Snugly by Knurling or Roughening Surface



Not infrequently bushings become loose, or are machined slightly undersize, and some mechanics use a cold chisel or prick punch to roughen the exterior surface, causing projections which make the bushing stay in place. A better method is to replace the bushing in the lathe, and increase the diameter by using a knurling tool on the exterior surface. This increases the diameter sufficiently, even when the bushing is 1/32 in. undersize. It makes a better job than the first-mentioned method.—G. A. Luers, Washington, D. C.

Old Gaskets Sawed Out from between Flanges

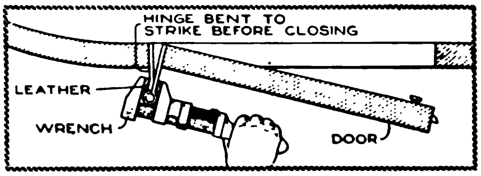
Often when a leaky gasket is encountered in a flange-joint pipe line, the pipes are so firm that the flanges cannot be pried apart to permit the ready removal of the old gasket. In such instances the latter can, after the bolts have been removed, be cut out with a saw, preferably one which has been discarded as unfit for regular use. It is essential that the adjacent faces of the flanges be clean before the new gasket is inserted, otherwise the joint is likely to leak. Where possible, the flanges should be forced apart, so that they can be scraped with a chisel. Where this cannot be done, the saw can be used as a scraping tool. In setting the bolts, all should be tightened to approximately the same tension. Otherwise, unequal strains may result, causing the joint to leak, or the gasket to blow out.—C. C. Williams, Des Moines, Ia.



The Old Gasket is Removed Handily by Sawing It Out with an Old Saw

Rattling of Automobile Doors Overcome by Setting Hinges

The doors of many automobile bodies, particularly the light cars, loosen up after considerable running, and cause a disagreeable rattle. Rubber-head nails, or strips of rubber cut from inner tubes, are frequently used to take up the play between the door and frame. A method that is more effective and requires a minimum of work is that of bending the hinge, as shown, using a wrench with a pad between the jaws to prevent marring the paint. The hinge so bent also assists in opening the door, the springlike action swinging the door partly open when the catch is released.



A Simple Remedy for the Rattling of Automobile Doors Is to Bend the Hinges Slightly

Making Dentil Moldings for Cabinet Trim

By CHARLES A. KING

CORNICES and similar effects in cabinetwork often require dentil moldings, and a quick method of making them is a valuable bit of knowledge for the woodworker and craftsman. A circular-saw table can be easily fitted to cut several moldings economically and accurately. The resulting strips may be handled and fastened in place like moldings. Figs. 1 and 2 show the two types of dentils commonly used, applied to furniture, and interior or exterior finish.

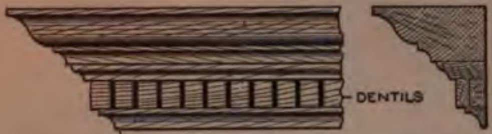


Fig. 1

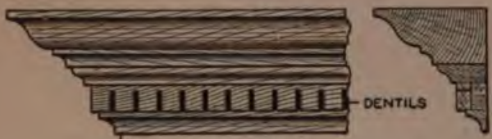


Fig. 2

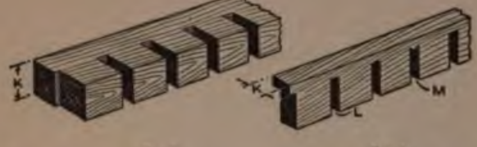


Fig. 3 Fig. 4

The Dentils are Made Accurately and Quickly by Cutting Properly Spaced Grooves across a Board, and Then Ripping This into Moldings

In fitting the saw for cutting dentils, as shown in Fig. 5, a piece of straight hard wood, A, 1¼ by 2½ in., is fastened to the two cutting-off gauges B, to make them move as one, and a saw cut is made, at C, with the saw which is to be used in cutting the dentils. The saw is adjusted to cut the desired depth and the board, properly trued up, is passed over it, making the first cut E. To gauge the second cut F, and succeeding cuts G, etc., a nail, D, is set through the piece A, as detailed in Fig. 5, at the left. The distance H, between the saw cuts, is marked carefully on piece A, and the nail, of a size to fit easily but snugly into the saw cut, is driven through, so that its point projects an inch or more. The board is drawn back with the rest, in the usual manner. The board is then shifted so that cut E fits over the nail, thus gauging the next cut. Each succeeding groove serves in turn as a gauge stop for the nail, in locating the next saw cut.

When the crosscuts have been made, the board is ripped into strips, as at J, Fig. 5, of the desired widths, as at K, Figs. 3 and 4. The two kinds of dentils are provided by making the cuts of suitable depth and ripping the board to the proper-size moldings. The face of each strip of dentils is held against the face of the ripping gauge, or fence, and the strip is sawed to the desired thickness and height of dentil. If small dentils are desired, the cuts across the surface of the board may be made upon both sides of a board of sufficient thickness, and the resulting strips each ripped into two dentil moldings. In making saw cuts for dentils of the type shown in Fig. 4, a saw must be used which will make the bottom of the cut straight, as shown at L; an ordinary cutting-off saw makes the cut as shown at M.

Large dentils suitable for use on cornices may be made by the same general method. A grooving head must be used in making the cuts between the dentils. Instead of the nail

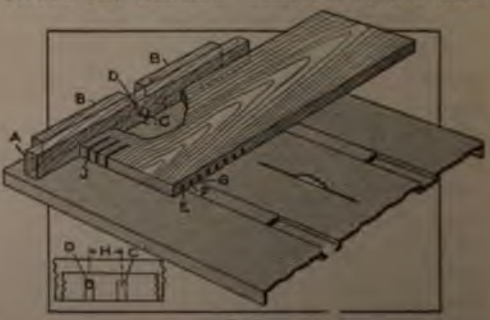


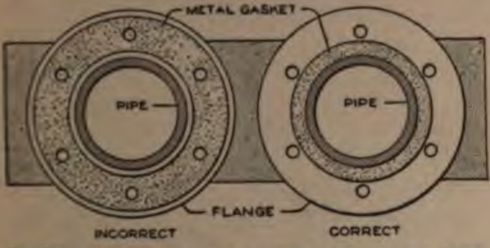
Fig. 5

An Ordinary Circular-Saw Table is Used for Cutting the Dentil Moldings, by Fitting a Gauge Device on the Usual Guides

D, Fig. 5, a piece of wood to fit the groove between the dentils is fastened securely to piece A, as a gauge stop.

Fitting Metal Gaskets Securely in Bolted Flanges

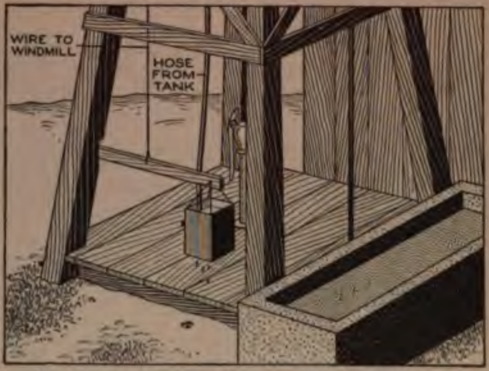
Where a metal gasket is used in the flange joint between two pipe lengths, it should be of relatively small diameter, and should be placed within the bolts, as shown, as against the incorrect method. The practice suggested is preferable because, where the gasket is of small area, the pressure to the square inch, imposed on it when the bolts are tightened, is much greater than if it has a large area, and a small-diameter gasket is squeezed tighter in the joint, relatively. Where rubber, or some similar yielding material is used for the gasket, it should be made by the method indicated as incorrect for metal. The bolts hold the gasket in place, and the usual pressure is sufficient to insure a tight joint.



The Metal Gasket is Cut to Fit Inside of the Ring of Bolts and the Rubber One is Fitted to Surround Them

Device Regulates Windmill to Maintain Water Supply

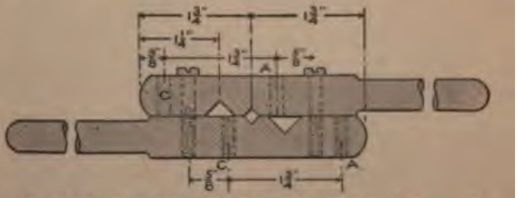
A busy farmer who depends on wind power to pump water for his stock rigged up an automatic device, as shown in the sketch, to regulate the windmill. By this means the pump is automatically brought into action, or shut off, when the water tank is in need of filling, or filled. A 5-gal. can with a small hole in the bottom was hung on the end of a 4-ft. horizontal lever, which is attached to the wire controlling the fan of the windmill. The overflow pipe of the storage tank was lengthened with garden hose so that its outlet was above the can. When the tank is full, the overflow fills the can and this weight turns off the windmill, stopping the pump. In 15 or 20 minutes a portion of the water leaks out of the can, and the weight being reduced, the mill again comes into operation. However, if the cattle have meanwhile lowered the water level in the trough, which is automatically refilled from the storage tank, the mill continues to pump until the tank is full.—F. E. Tuck, Nevada City, Calif.



This Device for Regulating a Windmill Does Its Work Automatically

Tap Wrench Fits Various Sizes of Shanks

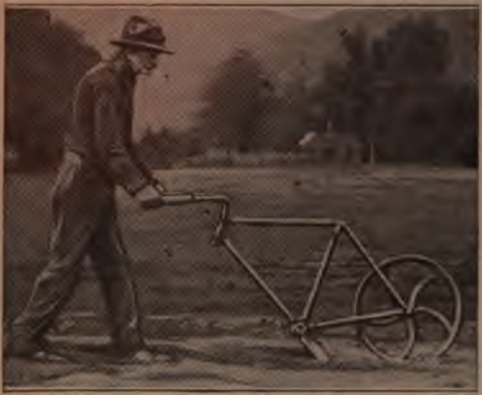
This tap wrench was made to take the place of different-sized wrenches. The sketch shows it assembled for small taps, less than ⅜ in. The other notches are used on taps larger than ⅜ in. The wrench gives more leverage with the larger taps, by shifting the handles to the proper notch positions. Both ends are the same. To match the large notches, holes A and C in the upper piece are matched against holes A and C in the lower piece.—Clarence H. Anderson, Worcester, Mass.



A Single Tap Wrench Does the Work of Several by Reason of the Double Notches

Hand Plow Rigged in Bicycle Frame

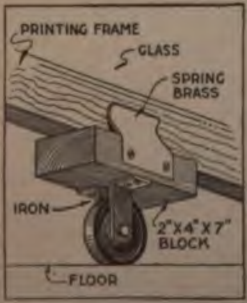
An old bicycle frame was easily converted into a substantial frame for a hand plow, as shown in the photograph, the handlebars being reversed, and used as plow handles. An old iron wheel was fitted into the frame where the rear wheel formerly was set, and the plowshare, shaped from a section of an old shovel, was bolted to the hub at the usual crankshaft bearing. A U-bolt of round iron was used for this purpose.—Robert W. Phelps, Los Angeles, Calif.



This Hand Plow was Rigged Up from an Old Bicycle Frame, an Iron Wheel, and a Section of a Shovel for the Plowshare

Detachable Caster for Heavy Blueprint Frame

It is hard to handle a large blueprint frame, in moving it out into the light and back into the print-washing room, without undue exertion and danger of breaking it. A handy method of transporting the frame is on a roller caster, suitably fitted with a block and side clips of spring brass, as shown in the sketch. The caster is slipped onto the bottom of the frame and grips just tightly enough to hold well in transit.

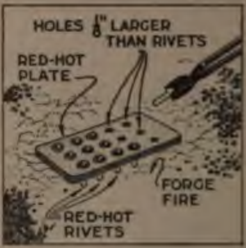


Breaking Porcelain Tubes Squarely

A good way to break porcelain tubes used in electrical work is as follows: Bore a hole through a timber, or block, so that the barrel of the tube will fit quite snugly into it. Insert the tube in the hole, and let the portion to be broken off extend beyond the face of the block. Strike the projecting end of the tube a sharp blow with the hand, or with a soft mallet, and it will break just even with the face of the block.

Handy Method of Heating Rivets in Forge Fire

The common method of heating rivets in a forge fire is to toss them into the coals and then withdraw the rivets individually when they are hot. This is an awkward procedure, and the method shown in the sketch is much better. Holes for the rivets are drilled in an iron plate which is heated before the rivets are inserted. The plate with the rivets is then packed in the fire and the entire arrangement withdrawn easily when the rivets are heated as desired. The plate can then be immediately refilled and a new batch of rivets heated.



Small Drains in Concrete Made with Pipes

Where it is necessary to make drainage grooves in concrete before it has become hardened, a neat groove of uniform size and shape may be provided by using a length of iron pipe of the proper diameter as a form. The pipe is partly imbedded, and removed carefully. If it is necessary to refinish the groove, a short section of pipe, smoothed to a polish and rounded up at the ends, makes a good improvised surfacer.

Apparatus for Locating Trouble in Aerial Telephone Cables

By A. J. VIKEN

CONSIDERABLE damage to aerial telephone cables is often caused by lightning burning off insulation on cable pairs, resulting in crossed wires, short circuits, and grounded pairs. To locate trouble of this nature, a homemade instrument was used with success, and the necessary repairs made to damaged cable pairs.

The chief parts, as shown in Fig. 1, are four dry cells, an induction coil, a buzzer, and a switch. The diagram shows the method of wiring. Three of the cells are wired through the primary windings of the induction coil B, and through the buzzer C, which serves to make and break the current. One side of the three dry cells in series is connected to one of the primary wires on the induction coil, at A. The other side is connected to the vibrating spring D on the buzzer. If the works from a doorbell are used as a buzzer, remove the gong, cut off the hammer, and bend the shank into shape, as shown at E. The point must be filed sharp. If a buzzer is used, solder a piece of wire to the spring, to take the place of the shank. A brass spring, F, is fastened in place with screws and adjusted so the point E will strike it and make a perfect contact at every movement, when the buzzer is started. The spring F is connected to the other end of the primary windings of the induction coil B. The buzzer is run by the fourth cell, which is connected to the binding posts in the ordinary way. A switch, G, is cut in on one side. The secondary windings of the induction coil are connected to two binding posts, at H, to which cords J are attached. These cords are used to connect the instrument with the cable pairs to be tested. The apparatus was arranged in a wooden box, as shown in Fig. 2.

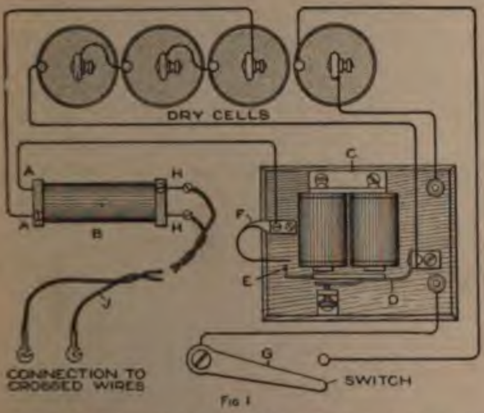
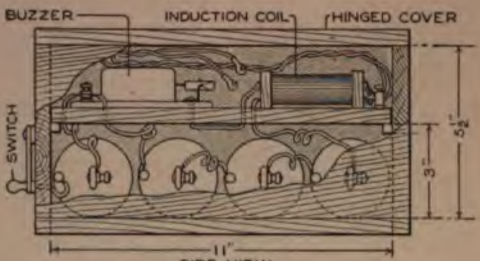
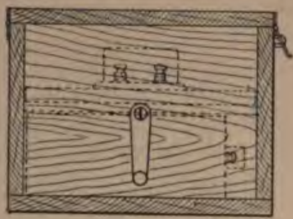


Fig 1

General Arrangement of the Testing Apparatus, Showing the Connections of the Induction Coil B, the Dry Cells, and the Buzzer C, the Circuit being Controlled at the Switch



SIDE VIEW



The Outfit is Inclosed Compactly in a Wooden Box so That It Is Readily Portable, Yet Properly Protected

Fig. 2

Several typical cable troubles are shown in Fig. 3: Pair O is short-circuited; two lines of pairs P and Q are crossed, and line 4 of pair S is grounded on the cover. To test damaged cable pairs the lineman goes to the cable terminal and with his telephone test set locates the crossed wires. The testing instrument is then connected with the two crossed wires by the cords J, and the buzzer is started by

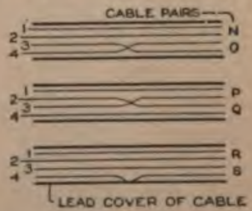
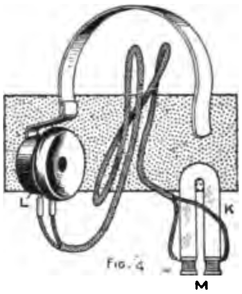


Fig 3



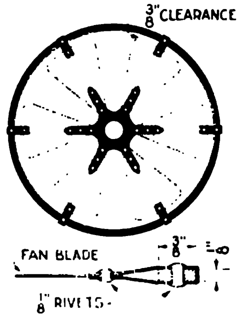
closing the switch G. A series of electric waves will pass through the loop formed by the crossed wires. The extreme end of the loop is at the point where the wires are crossed. The waves will travel to this point and back to the instrument at the cable terminal. By transforming these waves into sound, the end of the loop—the place of trouble—can be located within 1 in. For this purpose two telephone receivers are used, as shown in Fig. 4. A head strap permits use of both hands.

The magnet and coils K are removed from a receiver of the type used on desk telephones, and connected by a cord with a small receiver, L, which has a head band. To detect the waves passing through the cable, the receiver L is placed to the ear, and the magnet, with coils K, is held with the ends M touching the lead cover of the cable. If the listener is between the cable terminal and the place of trouble, a buzzing sound will be heard. By moving away from the terminal, a span at a time, the trouble will soon be located between two poles, as the sound will not be heard when the listener is beyond the end of the loop where the trouble is.

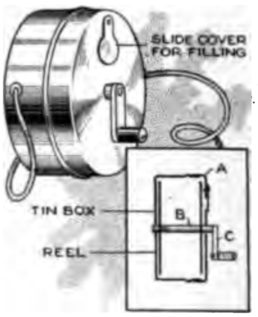
By the use of a cable car, the listener can travel slowly over the span and locate the exact spot where the wires are crossed. The cable can then be opened and repairs made. If testing over a long stretch of cable, it may be necessary to use more than three cells with the induction coil to make up for the additional resistance in a long loop. A small storage cell will also meet this requirement.

Rim Reinforces Cooling Fan

A kink that was used on an automobile cooling fan of the familiar design, in which the blades are riveted to small projections cast integral with the fan hub proper, will be of interest to autoists and others who repair cars. The blades continually became loose and bent because they were not held firmly enough. A ring of cold-drawn rod, 3/8 by 1/8 in. in cross section, was made, the diameter being sufficient to clear the fan blades by at least 3/8 in., as indicated. The ring was riveted to the six blades by means of strips of metal, 1/16 by 3/8 in. in cross section, and 1/8-in. round-head rivets. This made the fan rigid, and no further trouble was experienced with it.



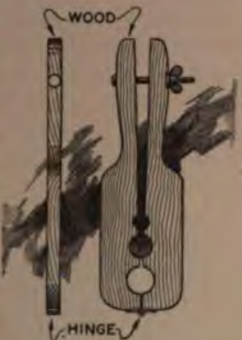
A Self-Chalking Chalk Line and Reel



A tin box with a tightly fitting cover was made into a useful reel case and automatic chalking device for a chalk line, as shown in the illustration. The box used was 4 in. in diameter and 2 in. deep. The line is wound on a rod, B, which is provided with two side disks as guides for the line. The shaft is set in the bottom and the cover of the box, and provided with a handle, C, as shown. An eyelet is set in the can where the line is drawn out. If the cover is very tight-fitting, it may be used to get at the interior of the box. Otherwise, a small slide cover of spring brass may be fitted over a hole in the top, and the cover soldered at the joint A. The spring cover should be made with a slight dish effect so as to fit the hole snugly.—R. B. Hayward, Keene, N. H.

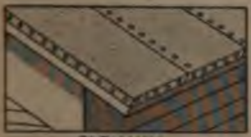
Tool for Holding Polished Metal Parts in Machine Operations

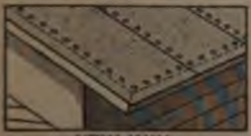
It is sometimes necessary to drill holes in highly polished metal parts, or those having threads on the outside surface. To hold such parts in a vise, a wooden holder should be made, as shown, suitable for several sizes. The holder consists of two strips of wood, shaped, and hinged together. The free ends have a bolt through them tightened with a wing nut. The holder may be held tight by pressure of the handles on light work, and the grooves shaped to suit special jobs.



Overhanging Edge on Roofing Found Superior

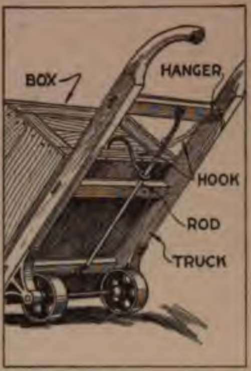
In putting on roofing, of the sheet or prepared kind, I have found that better wear is given and as good protection also, by setting the roofing so that it has an overhang at the edges of the roof instead of being nailed solidly along the edges. When the roofing material is folded over, as indicated, the nails are usually driven into the edges of the board. This allows water to creep in around the nails and affects their holding qualities, as well as deteriorates the roofing material. The overhang causes the water to be thrown clear of the edge.—T. J. Hubbard, Mendota, Ill.


OLD WAY


NEW WAY

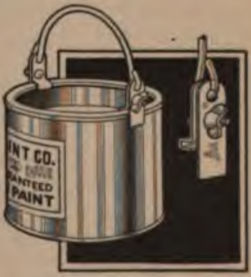
Hook Fitted to Hand Truck Holds Boxes

By fitting an ordinary hand truck, of the two-wheel type, with a hook which grasps the box or other load, preventing it from falling forward, the trucker may not only save time but also prevent damage to the load or to fellow workmen. The hook is shaped of wrought iron and slides on a rod, as shown. The rod is flattened at the end and fastened to the crossbars of the truck with screws. The hook is thus adjustable to boxes of various sizes.—R. B. Glenn, Atlanta, Ga.



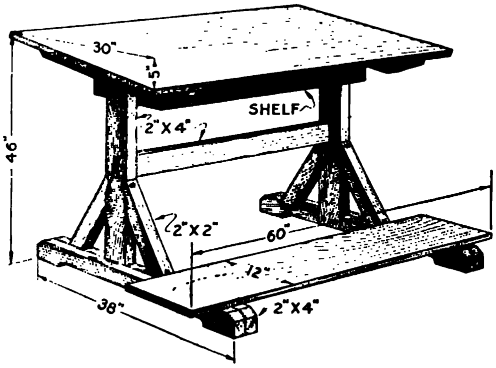
Detachable Handle Convenient for Paint Buckets

By the use of a simple handle fitting, which can be attached to an ordinary can or bucket, a convenient receptacle for paint, whitewash, or other materials, can be provided. The clamping device, to which the bail is attached, consists of two pieces of strap iron, shaped as shown, and bolted together with a stove bolt and wing nut. The inner piece is bent to grasp the edge of the can, and the grip is made firm by tightening the wing nut. The handle can be sprung sufficiently to accommodate it to cans within a reasonable range. A good kink is to provide several sizes of handles, if sufficient use is found for the device.—Bert Waychoff, Fort Collins, Colorado.



Strong and Inexpensive Desk Made for Shop Use

In a shop where a number of desks for various uses—clerical, drafting, and other work—were needed, a standard design of the type shown was adopted and made in considerable number. Two by four-inch stock was used for the main parts of the frame which were strongly braced. The top was slanted down toward the front 5 in. in the width of 30 in. across the top. The footboard was found desirable because of the nature of the shop floors. The desk is high enough for a workman standing, or for drafting or other work when seated on a high stool. The shelf provides for books, tools, and other accessories.—E. R. Garfield, New York, N. Y.



This Design for a Shop Desk was Adopted Where the Requirements Varied from Clerical Work to Drafting

Eyelets Handy in Lacing Holes of Light Belts

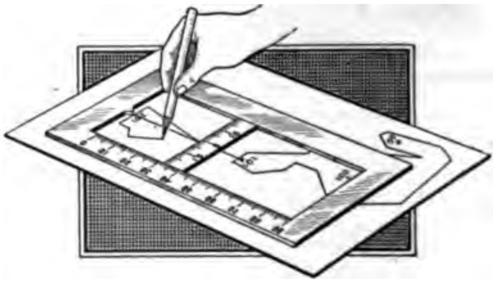
On small machine belts, especially where lacing must be done with no shop equipment at hand, eyelets are handy in the lacing holes. Belts on automobile fans, for example, become worn, and the lace pulls the holes out so that the belt has to be taken off, cut, and readjusted, sometimes on the road. I took my auto belt to a shoemaker and had him place a shoe eyelet in each of the holes, strengthening it as well as making repairs easy.—C. H. Thomas, Kennett Square, Pa.

Small Bolts Locked Quickly by Cutting with Chisel

Sheet-metal workers make many fastenings with small stove bolts, especially in work on ventilating systems. The nuts usually fit loosely, and to lock the bolts to them, the projecting end of the bolt is nicked with a cold chisel at the outer face of the nut. With several blows of the hammer, the end is broken off. The burring of the thread and the slight bending of the bolt end make an effective lock, preventing the nut from coming loose.—Walter M. Gill, Louisville, Ky.

Device for Mapping Surveyor's Data

A simple and timesaving device for mapping survey notes consists of a metal frame, graduated for longitudinal measurements, and a sliding scale, for offset distances, as shown in the sketch. The rectangular frame is made of sheet iron, the scale along the edge being glued on, or stamped. The sliding scale can be readily made from an old celluloid triangle, and must fit closely and squarely. To set the scales for mapping a series of indications from a station, the center point at the top of the hollow rectangle, which is directly opposite the zero of the longitudinal scale, is set over one transit point, and the zero of the sliding scale over the other. The edge of the sliding scale will then always be at right angles to the surveyor's base line for the data being mapped.



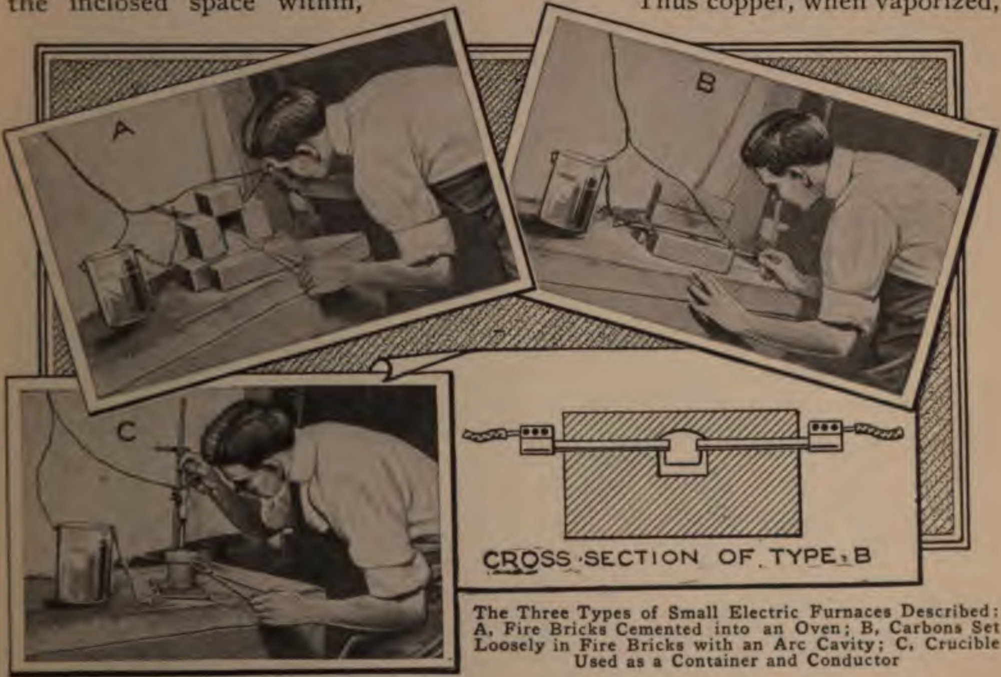
The Surveyor's Data are Mapped Quickly and Accurately by the Use of This Frame and Scale

Small Electric Furnaces for Shop or Laboratory

By W. M. MILLS

AN adaptation of the electric furnace, commonly used in experimental and other work, can be built for use in the small shop or laboratory, and successfully operated for such service. The current used may be direct or alternating, accumulation of heat being the essential. Three types of furnaces of simple and inexpensive construction, for various conditions, are described in this article, and shown in use in the photographs.

Type A, as shown, consists of several fire bricks arranged and cemented in an oven shape, with an opening through which access may be had to the inclosed space within, where the arc is produced. Two long carbon sticks pass through from the sides, and are adjusted so as to produce the best arc. The opening of the furnace can be screened during operation by a mica sheet, or amber-colored glass plate, to shield the eyes from the powerful light. In ordinary work, a current of 30 amperes and 110 volts was found sufficient, although more than this is necessary when working with refractory substances. A rheostat, or other suitable resistance, can be arranged to control the current. One of the type used with a stereopticon lantern proved satisfactory.



The Three Types of Small Electric Furnaces Described: A, Fire Bricks Cemented into an Oven; B, Carbons Set Loosely in Fire Bricks with an Arc Cavity; C, Crucible Used as a Container and Conductor

When ready to begin operations, one of the carbons is lowered slowly until the arc plays, and the front screen is placed in position. Considerable heat is soon generated in the oven. Common metals can be melted, and even boiled. Powdered rocks and minerals with some fluxes can readily be melted down. Quite a list of materials can even be vaporized, and, by the use of a focusing lens, their characteristic colors can be projected on a screen. Thus copper, when vaporized, gives a blue-green color, and other metals are similarly distinguished. The entire heating process can also be thus viewed.

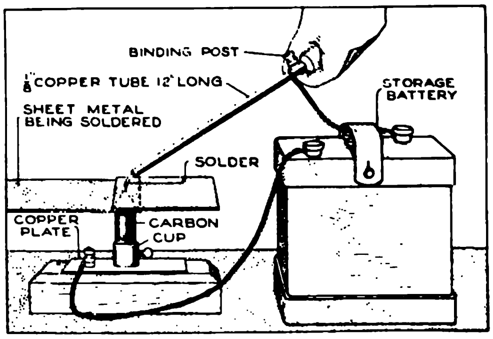
The type B furnace consists of two fire bricks laid one on the other and provided with grooves, in which two long carbons are fitted, and wired as detailed. In the center of the bricks, on the inside, there is hollowed out a small square cavity, and in this the ends of the carbons are adjusted to form the arc. In this cavity are placed the materials through which the arc plays. The seams where the surfaces of the bricks meet may be cemented, if necessary, but the adjustment of the carbons in their grooves must be loose to permit the gases generated to escape. As these gases are not always nonpoisonous, the usual precautions against inhaling them should be taken. A hole through the upper brick can be cut to allow the operator to view the action within the cavity. This opening is covered with a mica sheet. The cover can be removed, and the materials within adjusted, if desired. This type of furnace produces a much greater heat than type A.

The third type of furnace, C, is an arrangement where the cathode, or negative pole, is made up of a graphite crucible in which the material in work, reduced to a powder, is packed. The wire carrying the current is attached to the outside of the crucible, as shown, and the usual resistance provided.

A few suggestions as to possible uses of these furnaces are valuable: The less volatile and refractory metals and compounds, such as lead, zinc, etc., quickly melt, oxidize, and volatilize in the heat of these furnaces. Copper, iron, gold, and even platinum soon melt and come to a boiling point. Their vapors then pass off and upon examination, when the furnace is cooled off, their crystals will be found on the surfaces of the oven. Some of these are beautiful, especially those of gold. Quicklime may be produced easily in the furnace by permitting the arc to play on a piece of marble. The quicklime may be then tested by adding water to it, and the heat given off will show its nature.

Soldering Electrically without an Iron

Electrical soldering, based on the principle of spot welding, is both economical and efficient. Electric energy is used only during the interval of soldering, thus insuring low cost; and the device is also ready for instant use. A simple outfit, as shown, consists first of a short length of arc-light carbon, tapered at one end, while the other end is fitted into a copper cup, in which it is tightly held by a set screw. The copper cup can easily be formed by hand from a short strip, 1 in. wide and $\frac{3}{32}$ in. thick, made into a ring. The ring is soldered to a copper plate which forms the bottom of the cup, and serves also as a support. The plate is fastened with screws to a wooden base. Next procure a copper tube, 12 in. long, and $\frac{1}{8}$ in. inside diameter. Fit one end of the tube into a wooden handle. Binding posts, as shown, are set on the copper plate and on the tube, and these posts connected to a six or eight-volt storage battery. The outfit is then complete.



The Solder Point is Heated When a Contact is Made, Completing the Electrical Circuit

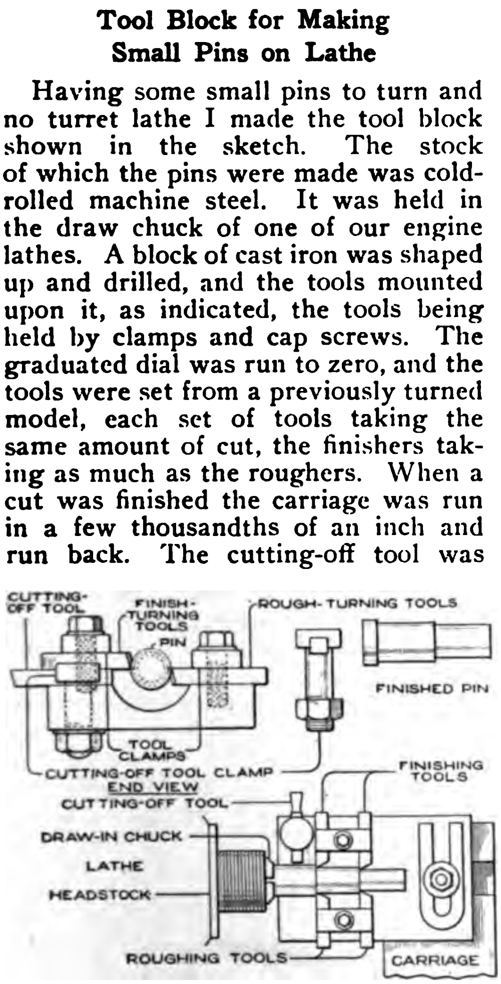
Before starting work, a 6-in. length of string solder is placed in the tube, leaving an inch or so projecting from the end. Place the metal sheets to be soldered on the carbon tip, as shown. Then touch the end of the solder to the sheets directly above the carbon electrode at the point to receive the solder. Immediately the carbon will glow, heating the metal sheets, which in turn melt the solder, permitting it to flow on smoothly, and in the desired quantity. The instant the solder string is removed from the sheets, the electrical contact is broken and the carbon point cools.—K. M. Coggeshall, Webster Groves, Mo.

Hanging Oilcan Handy for Overhead Work

When oiling machinery that can be reached only by standing on a ladder, it will be found more convenient to hang up the oilcan than to set it down where it is in danger of tipping over. It is only necessary to solder a brass ring to the oilcan stem near its end. The ring can then be hung over a hook on the ladder, or on the machinery.

Tool Block for Making Small Pins on Lathe

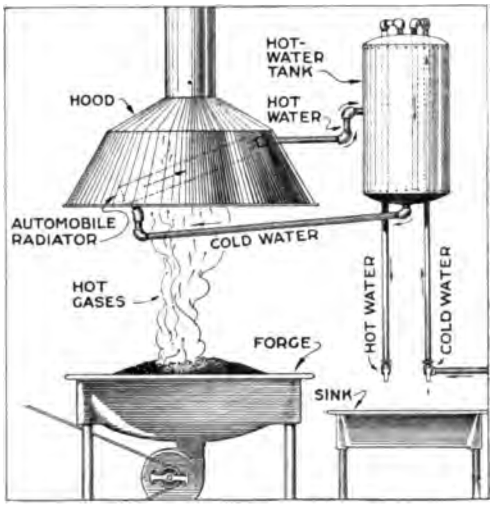
Having some small pins to turn and no turret lathe I made the tool block shown in the sketch. The stock of which the pins were made was cold-rolled machine steel. It was held in the draw chuck of one of our engine lathes. A block of cast iron was shaped up and drilled, and the tools mounted upon it, as indicated, the tools being held by clamps and cap screws. The graduated dial was run to zero, and the tools were set from a previously turned model, each set of tools taking the same amount of cut, the finishers taking as much as the roughers. When a cut was finished the carriage was run in a few thousandths of an inch and run back. The cutting-off tool was then brought into play, cutting off the stock and facing off the end.—Joe V. Romig, Allentown, Pa.



A Turret Lathe Not Being Available, the Pins were Quickly Made by the Use of This Special Lathe Fixture

Old Auto Radiator Converted into Shop Water Heater

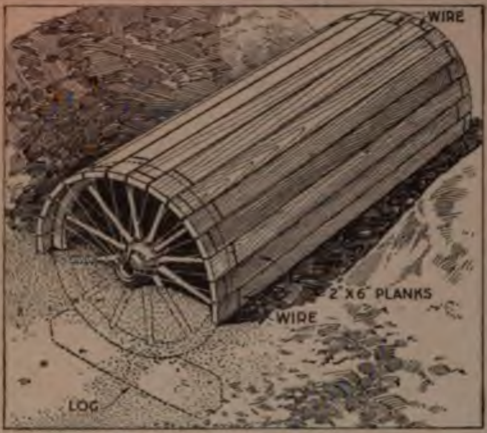
By reversing the work done by an automobile radiator, which was no longer fit for service as such, a blacksmith provided himself with a hot-water supply, which he appreciated especially in washing up after a hard day's work. In the arrangement which he devised, as shown in the illustration, the water circulating within the radiator is heated by the hot gases and air above the forge. The hot water is piped to a conveniently located storage tank. The method of arranging the pipe to provide for a cold-water supply and a hot-water delivery system is shown, the arrows indicating the direction of flow. The radiator is supported at an angle in the hood of the forge. The vent in the radiator is soldered, and the filler opening provided with a wiped joint, to which the ½-in. iron pipe, used to make the connection to the halfway point on the side of the 6-gal. tank, is attached. The heated water is taken from the top of the tank, and the cold water enters by means of a pipe extending through the top and down inside the tank to the bottom. Heat otherwise lost is thus conserved. —E. F. Hallock, Brooklyn, N. Y.



An Old Auto Radiator was Utilized to Provide a Water Heater for the Workshop by Conserving the Heat Above the Forge

Wagon Wheels Provide Forms for Concrete Culverts

In constructing a concrete culvert several old wagon wheels, of uniform size, were put to good use as supports for the form over which the concrete was laid. The wagon wheels were set on logs, or planks, which could easily be removed, thus dropping the wheels from their position under the forms. The planking, of 2 by 6-in. stuff, was wired to the wheels, by passing the wire around the planks and the hubs, as shown. The wires were easily cut in removing the wheels, and the planking was likewise easily withdrawn. Both the wheels and the planking could be used again.—Robert C. Knox, Arcadia, Fla.



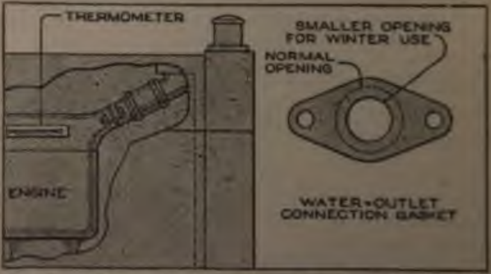
By the Use of Old Wagon Wheels Wired to the Planks Which Supported the Concrete for a Culvert, They are Easily Recovered for Further Use

Square-Point Center Punch Handy for Revising Marks

In laying out work in the machine shop, or other metal-working shops, it is customary to indicate centers and other points by means of center-punch marks. The punch is usually ground to a conical point, and it is difficult to distinguish various groups of markings, and especially revisions. A practical kink in this connection is to use a special punch for making revisions, or for indicating certain kinds of marks, the punch being ground to a square pyramid at the point. Triangular or other points may also be used if several different marks are desirable.—Edward M. Davis, Philadelphia, Pa.

Auto Radiator Water Gasket Altered for Winter Operation

Motorists realize the necessity of covering the radiator and hood of an automobile in the winter months, because the rapid radiation of the heat results in inefficient operation. A thermostatic valve set in the outflow pipe of the water system is used in many motors for cold weather. A simple change in the gasket at the outflow pipe, connecting the water jackets to the radiator, is nearly as effective as the thermostatic valve. It has an advantage in saving the nonfreezing solution, commonly employed, from rapidly boiling away, as often happens where the radiator is covered and maintained in a heated condition. The change in the gasket is merely in the substitution of one having a smaller opening. A gasket of one-half the normal area was used on a 22-hp. motor with excellent results. The proper size for the engine on which it is to be used can be best determined by experimenting, a gasket with a small opening being first set into the outlet water connection. A thermometer of the type used for vulcanizing rubber is placed on the cylinder head. If this records over 180° with the engine running rapidly, the gasket should be removed and the opening enlarged. When the proper-size opening is secured, the radiator is relatively cool.


THERMOMETER
SMALLER OPENING FOR WINTER USE
NORMAL OPENING
ENGINE
WATER-OUTLET CONNECTION GASKET

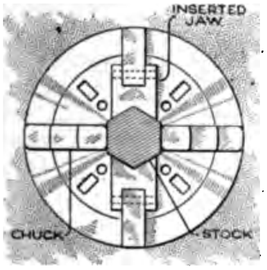
By Providing a Gasket with a Smaller Opening, the Radiator System is Operated Economically in Cold Weather

Worn Loose Pulleys Replaced by Adjoining Set Pulleys

Much noise was caused in a small machine and pattern shop by the pounding of loose pulleys on the countershaft, the bore in the hubs being worn slightly oval. The set pulleys were removed and put in place of the worn loose pulleys. The latter were then set on the shafts in place of the old set pulleys. The noise and undue wear on the shafting was thus overcome.—J. C. Hansen, Chicago, Ill.

Jaws for Holding Hexagonal Stock in Chuck

In machining hexagonal stock in a four-jaw chuck, trouble is usually experienced in centering the work. Under these conditions, special jaws like those shown in the sketch were made, and proved effective. By their use, it was only necessary to set the hexagonal stock into place and to adjust it in the usual manner. The inserted jaws are held against the chuck jaws by means of headless set screws.—C. H. Andrews, Boston, Mass.

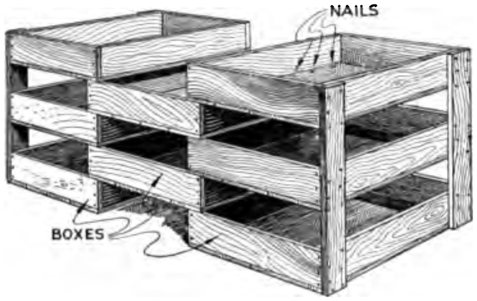


Roofing Paper as Packing for Pumps and Fittings

It is a common practice to use leather for packing union joints, pipe flanges, pumps, and similar fittings. The present scarcity and high price of leather makes a substitute especially desirable. It has been found that a good grade of three-ply felt roofing paper affords an excellent substitute for leather packing, and lasts a considerable time. The holes in the packing should be cut a trifle large, as the paper has a tendency to swell.

Stock Bins Built Up from Boxes as Units

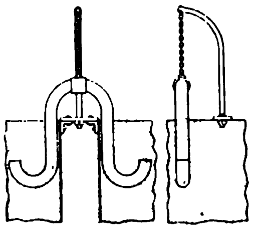
Boxes of various sizes may be joined into series of stock bins, if the boxes are sorted and those of the same dimensions joined together as shown. The boxes are nailed together in tiers, with short nails through the bottoms, where the edges overlap. The end tiers are supported by strips nailed at the corners. A convenient method is to build up the boxes into standard sections, of about the size indicated, and then to place these sections as required.



The Boxes are Arranged in Tiers to Form Handy Stock Bins. More Rows may be Added as Desired

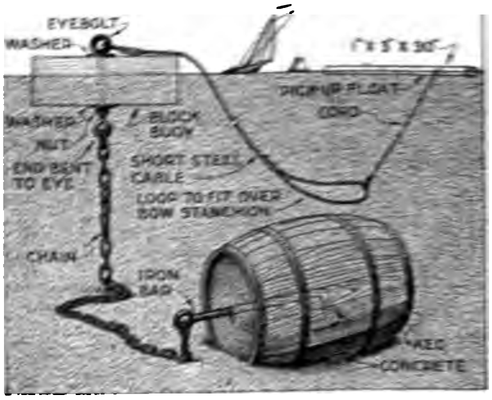
A Siphon That is Easily Kept Primed

A ready-primed siphon can be made by bending a piece of pipe into the shape shown in the illustration. After being once filled, the water, or other liquid, remains in the pipe as long as the outlets are level. It is preferable to balance the pipe by means of a chain, as shown, and connect it with a collar on the pipe, for adjustment. This method of siphoning provides a temporary means of connecting two adjacent tanks, and is useful for many other purposes where the flow is irregular and personal attention unavailable.—A. W. Allen, New York, N. Y.



A Substantial Float Mooring for Small Boats

[illegible] making a permanent mooring and anchor for [illegible] water [illegible] a boat [illegible] that would [illegible] in the [illegible] keg was filled with [illegible] shaped [illegible] and [illegible] at the [illegible] was molded. The [illegible] of a large block, and [illegible] fastened to a [illegible]



This Mooring for a Small Boat Anchored by Means of a Keg Filled with Concrete is Desirable Where Waves Are Choppy

it before the lower eye was shaped. A short steel cable, having a loop to fit over the bow stanchion of the craft, was fastened to the surface eyebolt of the float. A small pick-up float was attached to the loop of the cable, as shown, for convenience in running up to the buoy.—B. Francis Dashiell, Dundalk, Md.

Testing Compression in Cylinders of Automobile Motor

Automobile engines usually lose compression after considerable wear, and the charge in the cylinders is retained with more or less leakage. The causes are, in the common order of their occurrence: leakages through the spark plug and valve-cap joints; leakage through exhaust valves, and leakage past the piston rings. If each cylinder lost compression in equal degree, the results would be only loss of power and increased gasoline consumption, but this is seldom the case. In any engine in which there is loss of compression, some one cylinder will be found to lose its charge more rapidly than the others. Because of the resulting unequal pressure exerted by the pistons upon the rotating members, the engine vibrates, pounds under a heavy load and develops noisiness in the valve motion. These conditions should be remedied promptly.

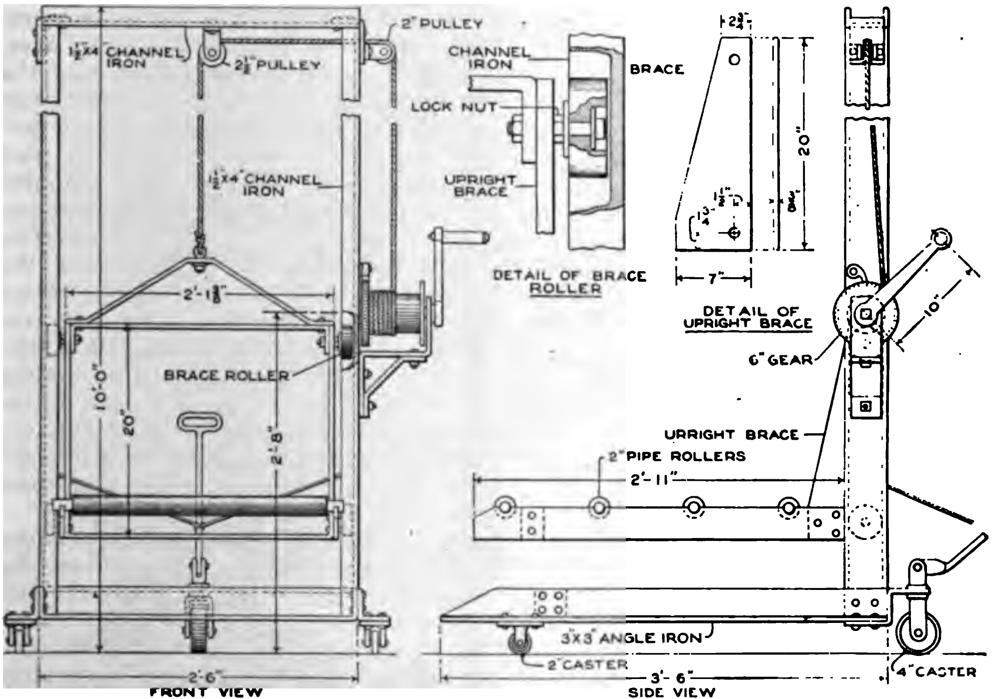
The usual method of testing compression is to turn the engine over, against compression, by means of the cranking handle, noting the resistance offered by each cylinder. A much better method is to run the machine part way up a moderately steep, smooth-surfaced grade, stop the car and engine, set the engine into reverse, engage the clutch, and, releasing the brakes, allow the car to back down until stopped by the cylinder compression. If the compression in the cylinder taking the load is approximately perfect, the car will remain motionless for several minutes; if not, the car will settle back against the compression stroke in the next cylinder more quickly, relative to the leakage.

The identity of the cylinder under compression can be determined by testing with the priming cocks, and once the order of compression is found, a continuance of the backing experiment will determine very accurately the relative compression in each cylinder. Cylinder oil squirted around spark-plug and valve-cap joints betrays leakage by foaming. The condition of the exhaust valves can be discovered by inspection. When the joints and valves are tight, continued loss of compression indicates leakage past the piston rings, possibly resulting from lack of lubrication, sticking, or distortion of the rings caused by deposits of carbon. Excessive heating of the motor base also indicates leakage past the piston rings.—Hayes Bigelow, Brattleboro, Vt.

Winch Truck for Piling and Loading Boxes

By P. P. AVERY

IN a warehouse where many cases of goods were piled 10 or 12 ft. high, it was found desirable to devise a mechanical means of raising the boxes to the top of the piles. An elevator arrangement, which is described as a "winch truck," was built for the purpose, as shown in the illustration and the working drawings, and proved a great time and work saver. The boxes are originally piled on wooden platforms, built over 2 by 4-in. frames, the platforms being set across supports, raising them from the floor so that the winch-truck carriage can be run under them. By raising the platform of the truck slightly, by means of the drum and crank device, the entire pile of boxes is lifted, with their supporting platform, and then transported to the new location. At this point, the carriage with its load is raised, as desired. The upper boxes are removed and stacked on the pile. The truck may also be used in unloading, from a vehicle or from a pile of boxes or other similar containers, the general process, of course, being reversed. The winch truck is substantially built, and the design, shown in detail, is for boxes or crates of ordinary size. The dimensions may be varied, using the same general design, to suit the truck for the handling of smaller or somewhat larger boxes or containers.



By the Use of This Winch Truck, Boxes or Similar Containers can be Piled, or Taken Down from a Pile or a Load, with a Minimum of Labor and at a Considerable Saving of Time

The main vertical frame is built up of 1½ by 4-in. channel iron riveted at the joints. The channel iron is set with the channel inward, so that the carriage is guided in the channels, by means of rollers bolted to the sides of the carriage, as shown in the front and side views, and in the detail of the brace roller.

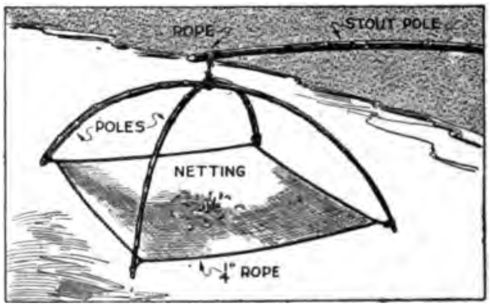
The floor truck proper is built up of 3 by 3-in. angle iron, and is carried on 2-in. casters and a 4-in. caster mounted with a fork and a handle, for pulling the truck and guiding it, as shown. The bearing above the large caster is heavily reinforced with a plate of iron, bent to the shape shown in the side view, and riveted to the lower truck frame. The main upright frame is riveted to the lower truck frame, and may be suitably braced to it, if the boxes to be lifted are quite heavy.

The winch drum and crank arrangement is shown in the front and side views, and is of the usual geared type. A single gear with a pawl may be used for handling comparatively light loads, or a train of gears may be used for heavier loads with a stronger framework. The pulley arrangement for conducting the cable to the load is clearly shown, the pulleys being carried between angle supports.

The truck carriage, which supports the load, is shown slightly raised from the lower frame. It is strongly built of iron bars, into the upper edges of which 2-in. pipe rollers are set, as shown. These rollers are handy in placing the boxes on the carriage, or in removing them. The carriage is braced to its upper framework by upright braces, made as detailed, and riveted into place. These braces carry the brace rollers, which are guided in the channel irons of the main frame. The method of fastening the other parts of the carriage is shown in the front view. The metal parts, other than the bearings, should be given a coat of red lead when the work is assembled, and later suitably painted. The working parts should be properly greased.

Large Minnow Net Made of Branches and Netting

The fisherman who does not care to take extensive equipment with him on a trip often has need of an efficient means of catching minnows, especially in places where it is difficult to wade and make use of an ordinary minnow net. A handy way to arrange the net is to attach it to branches, cut on the spot, the poles being lashed together, as shown in the sketch. The net is reinforced at the edges with rope, and fitted with ropes for tying it at the corners. The net rigging is supported from a stout pole, making it convenient to use the outfit even from a high bank.



The Rigging for This Homemade Minnow Net is Quickly Arranged at the Fishing Spot

Scraping Babbitt Bearings to a Nice Fit

After a babbitt-metal bearing has been poured in the box, using the shaft as a core or mold, it should be scraped so that it will accurately fit the shaft. A good tool for this purpose is one homemade of triangular cross section, like a three-cornered file without the teeth. If such a tool is not available, one may be improvised by grinding the teeth from such an old file with an emery wheel. The ground faces should be honed smooth. The scraping is done with the edges, which must be sharp.

In use, the portion of the shaft which is to rotate in the babbitted bearing is given a thin coat of lampblack, or Prussian-blue oil paint. The painted shaft is placed in the bearing and turned by hand a few rotations and removed. At the points where the shaft contacts with the bearing metal, paint from the shaft will be left on the babbitt. These spots are scraped with the tool. The shaft is again painted and rotated, and the high spots scraped off. The process is continued until the paint is found to be evenly distributed over the entire surface of the bearing. The shaft should have a good "running fit" but without sufficient play to permit knocking.—Frank R. Cameron, Chicago, Ill.

Ankle Strains in Driving Auto Relieved by Heel Block

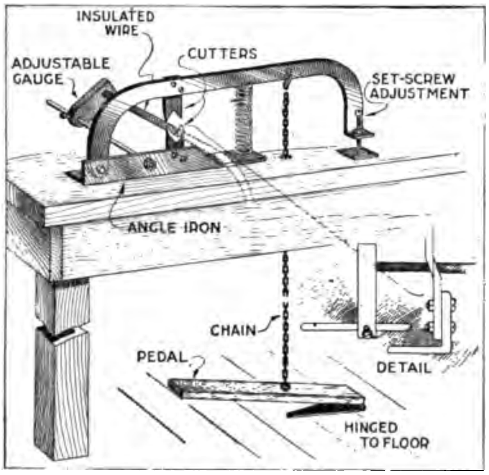
Leg and ankle strains, attending the operation of a foot throttle in driving an automobile, may be effectively reduced by the installation of an angular block to serve as a foot rest. The block is bolted to the floor, with the bolt heads countersunk, and notched to form a socket for the heel. The angle of slope up toward the throttle should be such that the sole of the shoe rests flat on the block, when the accelerator is completely depressed.—A. L. Payne, Garfield, N. J.

Large Jigs and Templates Painted Red for Identification

The annoyance of having large jigs and templates mistaken for commercial machine parts and being carted out of the shop was avoided, in a large plant, by giving them a coat of red paint. Because of their unwieldiness, these parts are ordinarily kept near the mechanics using them. The conspicuous red coloring identifies these special parts, and laborers are less likely to truck them away by error.—Joseph Plogmann, Cincinnati, Ohio.

Pedal-Control Wire-Stripping Bench Tool

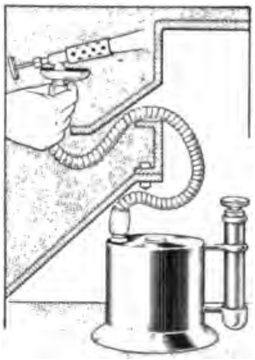
A tool that will be found useful, in a shop where electrical wiring is done, is a wire stripper which can be set to remove uniform lengths of the covering from the wire. The outfit is fitted on the bench, or table, near the edge, as shown, and the wire is fed in between the cutters, against an adjustable gauge. The operator presses on the pedal and gives the wire a slight turn, so as to cut the covering all around. It may then be removed easily. The set-screw adjustment provides for cutting various sizes of wire. The detail construction of the cutters and gauge is shown at the right. The main frame is shaped from a strip of iron, and the cutters are of tool steel. A coiled spring raises the cutter and frame, releasing the wire.—C. C. Spreen, Flint, Mich.



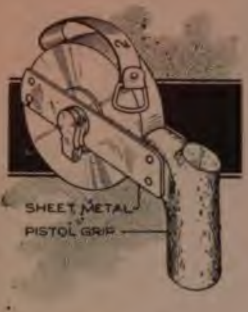
The Gauge is Set as Desired and the Ends of the Wire Thrust between the Cutters, Pressure being Applied on the Pedal

Blowtorch with Flexible Tube for Work in Close Spaces

In various kinds of repair work, especially on automobiles, brazing and soldering must be done in places where it is difficult to use a blowtorch of the ordinary type, unless it is adapted especially for the job. Under these circumstances, a blowtorch of the usual type was fitted with a flexible tube, as shown, the burner being fastened at one end of it. By this means the flame could be directed on spots which it would otherwise not reach. The tube is quickly disconnected and kept with the torch for convenient use.—Earl Botten, Boscobel, Wis.

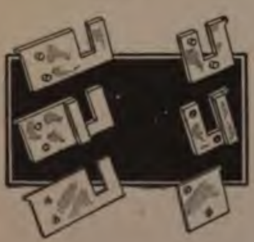


Homemade Pistol Grip for Surveyors' Tape



The tape commonly used by surveyors is hard to hold, especially when the hands are cold. The sketch shows a pistol grip that was cut from a tree branch. It measures about ¾ in. in diameter and is attached to the reel case by means of two strips of sheet metal, ⅝ in. wide. The strips are attached to the case by rivets, which pass through the rim of the case, so that they are not in the way of the tape. Two rivets secure the strips to the handle. The grip is especially handy in unwinding or rolling the tape.—F. H. Linthicum, Annapolis, Md.

Homemade Built-Up Liners for Linotype Machines

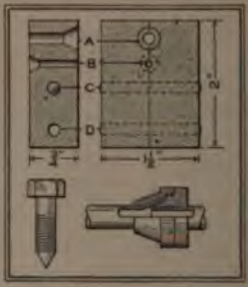


Having to set different bodies of type on the linotype machine, and being supplied with only one liner of the desired length, I made some liners which can be built up to various thicknesses, as required. I took a piece of brass rule of the desired thickness and length, and ground it down to the height of the mold. Two slight projections were then made in the surface of the strip to fit into two holes, bored in the liner as shown in the sketch. By building up with several strips of suitable length, various thicknesses are provided, saving the expense of buying special liners for each size of type desired.—Frank B. Waltrip, Hopkinsville, Ky.

Support for Garage "Free-Air" Hose at Curbing

A convenient support for the "free-air" hose of a garage was fashioned from a piece of pipe, and set into the concrete of the street curbing. The main standard is a pipe set vertically, with two horizontal hooks fixed near the upper end, on the sides of the pipe, to hold the hose. The support prevents the hose from falling in the gutter, where it may be damaged by vehicles, and also attracts attention to the garage and its "free-air" service. The cost of this device is trivial when compared with the advertising it gives. —Jos. Thalheimer, Jr., Phoenix, Ariz.

Device for Making Bell Ends on Tubing



In making joints in brass and copper tubing, commonly used in oil and air-pipe lines, the sections are usually connected in a screw joint, or union, and one of the tube ends is formed into a "bell end." A tool for forming these bell ends uniformly and quickly is shown in the sketch. It consists of a metal plate, ¾ by 1½ by 2 in. in size, and provided with countersunk holes for two or more standard sizes of tubing. The tube is inserted in the die A or B, depending on the size, and clamped in place, with the end to be shaped just flush with the surface on the side which is countersunk. A machine bolt, ground to the proper point, is used to spread the tube end in the countersunk hole. Pins, C and D, hold the two sections of the die in place while it is being clamped. The plain end of the tubing is fitted into the bell end, as detailed. The bell end is removed from the die by releasing the pins C and D.—D. C. Goff, Kenosha, Wisconsin.

Shop Notes

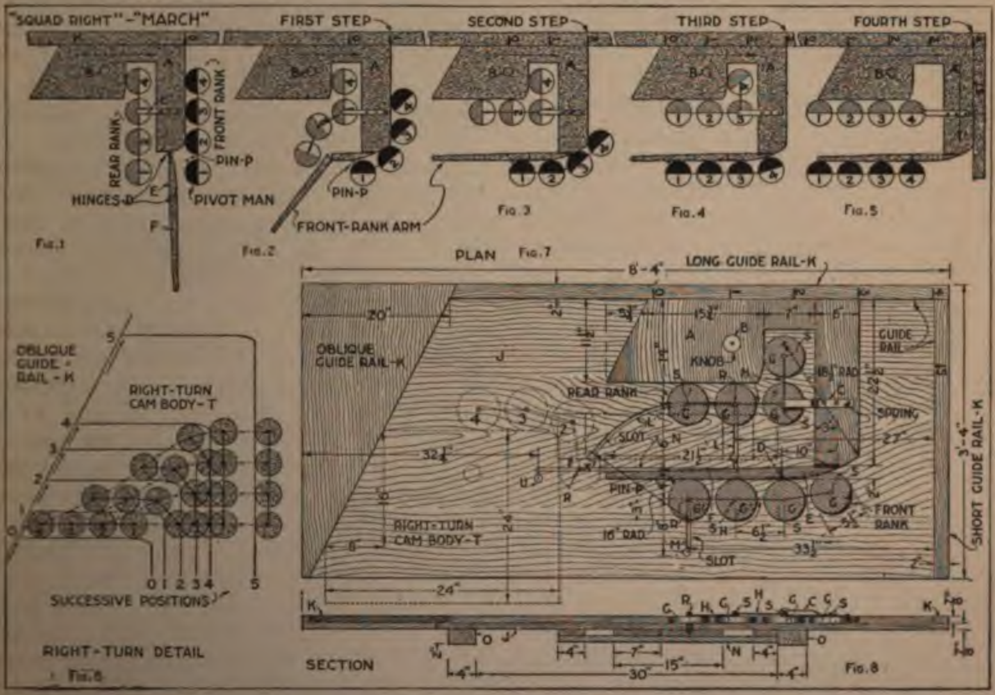
A Machine That Executes Military-Drill Movements

By LIEUT. FRANK SHORT

THE squad-right and right-turn machine described and illustrated herewith is designed to be of service to the man who has difficulty in grasping the details of these two fundamental military-drill movements. Any company commander can have such a machine constructed, and it will illustrate the movement in a way that cannot be equaled by any verbal or graphic description.

Construction of the machine requires no elaborate equipment, and all necessary dimensions are given to permit the proper shaping of the cam surfaces. The scale of the whole may be changed at discretion.

In operation, for "squad right," the cam A is placed on the table, as in Fig. 1, with the long edge in contact with the long guide rail K, and with the square corner in line with the division point 0. The front-rank men, being linked together as indicated by H and S, in Figs. 7 and 8, are lined up touching the right-hand outside edge of the cam, as in Fig. 1, the bolt R of the pivot man passing through the slot M,



Fundamental Military-Drill Movements are Executed on the Machine in a Manner Which Points Out to the New Recruit the Exact Position He should Occupy during Each Successive Movement. After Learning the Movements by Watching the Mechanical "Men" He Has Little Difficulty in Taking Up the March

washers and nuts preventing its being pulled off the table J. Parts N and O indicate structural details. The front-rank arm joints, E and F, extend parallel with the short cam surface and to the right of the front rank, thus avoiding the rear rank. In the latter, No. 2's pin passes through the curved guide slot L, at its extremity, X, while No. 3's pivot pin, S, which is longer than the others, is held in the cup of the holding spring C. No. 4 rests against the inner surface of the cam in the same relative position as in the illustration, and No. 1 is in prolongation of the line of the other three.

When the knob B is pushed toward the short guide rail, keeping the long side of the cam in contact with the long guide rail, the successive changes in the movement are executed, as shown in Figs. 2, 3, 4, and 5. The squad is in line in the new direction when the cam reaches the short guide rail, and is caused to step off in the new direction by a movement of the cam in that sense.

To make a right turn, the pin P, shown in Fig. 7, is removed from the table, and the movement is executed for one rank only by the cam T. The front rank of the squad is used, No. 1 being placed with its bolt R in the opening of the slot L, at U. The rank is placed in the extension of the long slot, and the cam T is placed with the oblique edge parallel with the oblique guide rail K, and with the adjacent edge in contact with the line of men, as shown in position 0, Fig. 6.

Movement of the cam parallel with the oblique guide rail until the long guide rail is reached completes the turn, as indicated by the successive movements in Fig. 6. The rank is caused to take up the full step by moving the cam along the long guide rail.

The execution of squad right by the machine is nearly perfect. By changing the number and spacing of the division points on the guide rails, the machine will satisfy a "six-count" advocate as well as the "four-count" faction, for which it is marked out. Right turn is not so accurate. No. 1 and No. 2 are approximately correct in their action, but Nos. 3 and 4 oblique are at too steep an angle and make the second oblique just before coming into the line, which is advancing at somewhat less than a half step. The movement, however, is sufficiently accurate to give a clear idea of the proper execution, and is an excellent illustration.

In both movements the machine may be operated fast or slow, or may be stopped in any position. Each man of a squad may watch the path of his corresponding "man" on the machine and is presented with a clearer idea of where he belongs at each instant than is obtainable from talks or sketches. In addition, the machine itself is interesting to the men, and aids to incite interest in the performance of the movement.

Theft of Shovels Prevented by Chain and Padlock

On a large construction job requiring the use of many hand shovels, considerable annoyance was experienced in the repeated thefts of one or two shovels overnight. This was stopped by assembling all the shovels in one place at night, and running a strong chain through the D-handles, fastening the two ends of the chain with a reliable padlock, and attaching the entire lot to a heavy tool box.—Roy H. Poston, Flat River, Mo.

Respirator Made of Cotton and Muslin

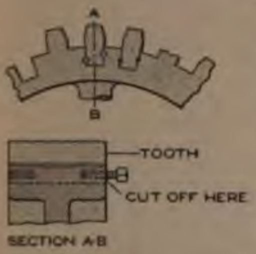
An excellent respirator may be made of a thick sheet of carded cotton wool placed between two pieces of muslin. For emergency use the material can be pieced or tied together suitably. Where a more substantial article is desired, for use in shops, buffing rooms, by janitors in sweeping dusty floors, etc., the cotton can be covered neatly in a strongly sewed mask, with tie ribbons at the back.—William A. Lorence, Richmond Hill, N. Y.

Drawings Superseded by Others Plainly and Promptly Marked

When a drawing for shop or construction use is superseded by another, the original should be plainly marked "Superseded," and the title, serial number, and other designations of the later drawing should also be marked on the first one. This safeguard takes only a few minutes' time, and may save costly errors by the issuance of the wrong drawing.—C. H. Post, Denver, Colo.

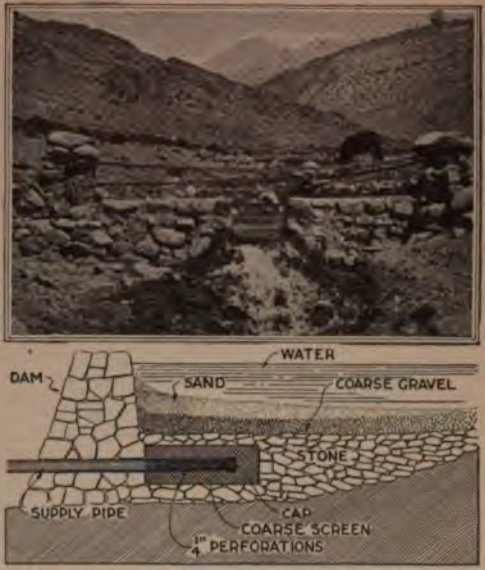
Patching Teeth into Broken Gears

Costly gears, having one or several teeth stripped, may be repaired to render indefinite service by fitting new teeth as illustrated. A slot is first cut into the gear flange to remove all traces of the broken tooth, and a new tooth is fitted as indicated at AB. A cap screw, threaded in on either side of the new tooth and cut off flush with the gear flange, precludes all possibility of the insert working out.



Small Water-Supply Reservoir Built in Mountain Stream

Securing a supply of clean water from a stream at all times is satisfactorily accomplished by the following method: A part of the stream is chosen where there is a fall of at least 1 ft. in a distance of 30 ft. The water is then temporarily diverted, and a dam built across the channel. A clear-water delivery pipe is then installed as near the bottom as possible. A spillway should be provided large enough to take care of maximum overflow. The supply pipe should terminate several feet inside the wall, being plugged at the end. The water enters through a series of 1/4-in. perforations along the pipe. A wooden framework covered with coarse wire netting surrounds the intake end of the pipe. Over the framework and the bottom of the channel a layer of large stones is placed. The stones are covered with gravel or chippings, and then with a layer of sand. Clarification will depend upon the thickness of the uppermost surface.

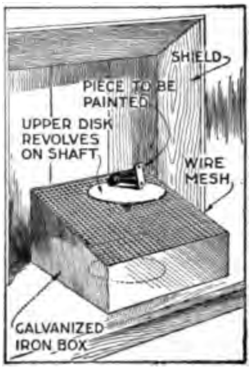


A Steady Flow of Water Free from Surface Dirt is Obtained through the Pipe

Door Knobs Make Convenient Handles for Bits

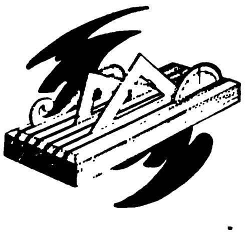
An excellent handle for boring bits, screwdrivers, and similar tools, for use in cramped places, is a discarded door knob. For occasional use it will be found satisfactory to use the knob without any alteration, simply inserting the bit into the socket and tightening with the screw. The bit has a tendency to wobble slightly, but otherwise is held securely. By beveling off the end of the hole in conformity with the shape of the bit shanks, or by filing off the shanks to an even thickness, a perfect fit is obtained.

Small Machine Parts Painted by Use of Novel Device



When a rush order was received in a factory for parts which demanded a coat of lead, a spraying device was constructed as illustrated. Over a galvanized chip pan a piece of heavy iron mesh was placed. A disk, 12 in. in diameter, with a bearing operating on a piece of 1-in. shafting, was mounted on an iron base and placed inside the chip pan. The shaft extended through the mesh, allowing the disk to revolve 6 in. above it. Lead was then sprayed on with an ordinary spray nozzle. The disk is spun around on the shaft by the application, covering the parts on all sides. All waste paint was caught in the pan to be collected and used again. A splatter shield is placed behind the pan.

Rack for Flat Tools

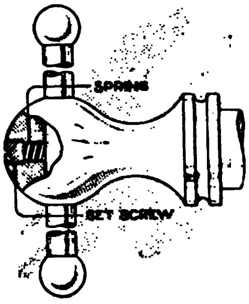


Every user of drafting tools knows what a nuisance it is to search for triangles, protractors, and other flat tools under a mass of sketch paper and other accessories. By making a rack for these tools, and once getting into the habit of placing unused tools on the rack, much time can be saved, and the temper of the draftsman frequently preserved. The rack shown in the sketch was made from a block of wood, the grooves being cut on the circular saw, or by hand. The edges of the grooves should be rounded slightly so that the tools can be slipped into place easily.

Sandpaper Prevents Slipping of Work in Miter Box

The creeping of small pieces of work, which are being sawed in a miter box, is often almost unpreventable, especially when hard wood is worked. To overcome this, glue strips of No. 1½ sandpaper on the back of the miter box, ⅛ in. from the floor of the box. This is particularly suited to wooden miter boxes, though it can also be applied to the steel box. This method does away with slipping, and does not affect the accuracy of the box, or freedom in handling the work.

Friction Lock Keeps Vise Ball Point from Injuring Fingers



Pinched fingers, such as frequently result from the ball points of a vise dropping on a workman's hands, may be avoided by the installation of a friction-locking mechanism, as illustrated. The spring and set-screw can be located on any convenient part of the vise screw. The shifting lever should be removed to make the addition.—George F. Kuhne, East Rutherford, N. J.

Coin Is Handy Gauge for Spark-Plug Gap

The ignition spark on a spark plug for gasoline motors jumps across a gap of about $\frac{1}{32}$ in., between the center wire, or electrode, and the wire connected to the body of the plug. Motorists not skilled in adjusting the size of the gap, which may for some reason be wrong, will find a ten-cent piece a handy gauge for the spark gap, the adjustment being made, of course, with the usual precaution against the presence of an electrical current.

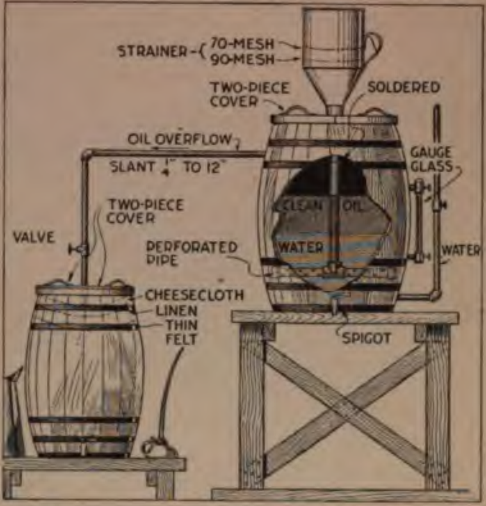
File Handles Convenient on Large Tee Wrenches

File handles, bored out and fitted to the handles of a large T-wrench, provide a firm hold, minimizing the danger of injury by the slipping of the tool, especially when the hands of the workman are greasy. With a handle of this type, it is easier, also, to exert greater power on the wrench, without bruising the palms.

An Oil Filter and Tank for the Shop

An oil filter which may be constructed from two old casks in any small machine shop or garage will save many times its original cost in the reduction of oil bills. A 25-gal. cask and one of 15-gal. capacity are placed, as indicated, and connected by a pipe having a valve near the lower barrel. A ¾-in. water-supply pipe is led in near the bottom of the larger barrel, and a glass gauge is installed to determine the water level. A 2-in. vertical pipe, connected with a horizontal pipe at the bottom, is put through the head of the large barrel. The horizontal pipe is capped at both ends and has two rows of ⅛-in. holes drilled in it. A large funnel—an oilcan, as shown, may be used—is soldered to the vertical pipe and properly braced to the head of the cask. Two screens, one 70-mesh and the other 90-mesh, are soldered inside the body of the funnel, as shown in the illustration.

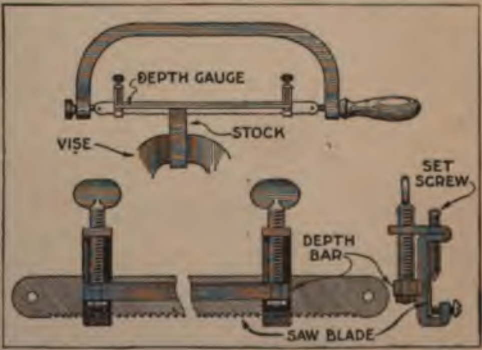
Water is let into the large cask to a depth of 18 in. and the perforated horizontal pipe is secured within 5 in. of the bottom. Used oil is poured into the funnel and is washed by rising through the water as it emerges from the perforations in the horizontal pipe. Sediment is deposited at the bottom, while the clean oil floats on top of the water until its level gets above that of the overflow pipe. When the valve in the overflow pipe is opened the washed oil runs into the clean-oil reservoir through a filtering layer of cheesecloth, and three layers of felt. This disposes of any foreign matter that may not have been removed in the washing. The filtering material should be removed and washed in kerosene whenever sediment is apparent.—John E. Cahill, Jr., New York, N. Y.



This Simple Filter Permits Old Oil to be Used Many Times

Depth Gauge for Hacksaw

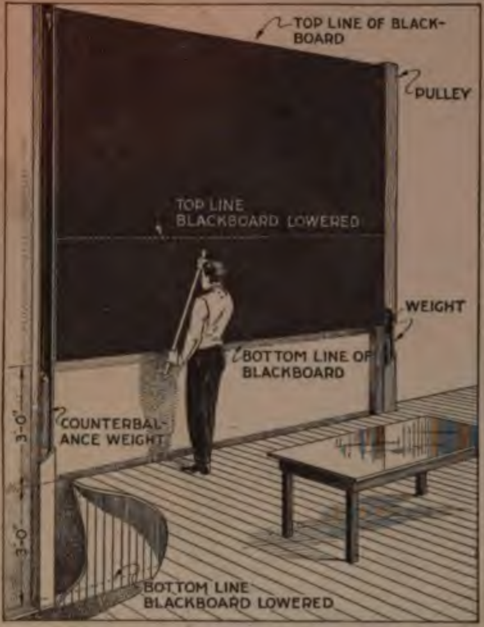
Cutting to a designated depth with a hacksaw is accurately accomplished by fitting the blade with a depth gauge as indicated by the sketch. Most of the parts essential for the making of such a gauge can be picked up about the shop so that very little machining or fitting is necessary. The finished tool not only aids in accurate work but saves many broken saw blades as well.



The Depth Gauge Eliminates Cutting Deeper than the Desired Distance

Adjustability of Big Blackboard Makes Stepladder Needless

By mounting a large blackboard, or drafting board, in a sash and counterbalancing it with weights, so that it may be raised or lowered like a window, the necessity of using a stepladder when working near the top, or of bending in an uncomfortable position to reach the bottom, is obviated. The convenience of the arrangement is made apparent and the plan of construction indicated clearly by the accompanying illustration.—Kingston Forbes, Flint, Mich.


TOP LINE OF BLACKBOARD
PULLEY
TOP LINE BLACKBOARD LOWERED
WEIGHT
BOTTOM LINE OF BLACKBOARD
COUNTERBALANCE WEIGHT
3'-0"
3'-0"
BOTTOM LINE BLACKBOARD LOWERED

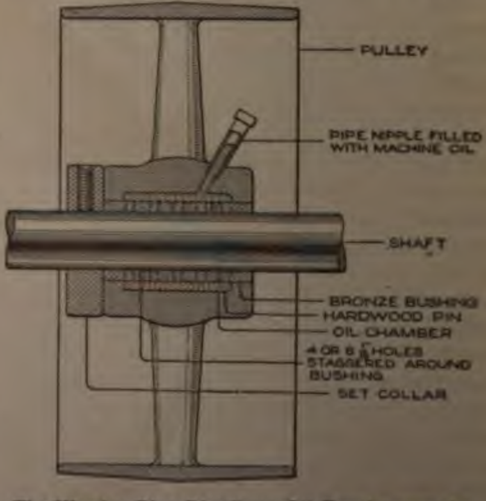
Either the Top or Bottom of the Board may be Brought to a Convenient Working Height by Lowering or Raising It

Loosening Rusted Engine Pistons with Hot Water

Engine repairmen are often confronted with the job of getting into shape an old gasoline motor, or similar engine, that has been rusted badly. The pistons in such an old engine were rusted fast and after trying various methods of soaking them in oil, they were loosened by the following method: The oil was permitted to soak thoroughly. Boiling water was poured into the hopper of the engine, and allowed to circulate around the cylinders only long enough to heat the cylinder walls but not to affect the pistons. The pistons were then driven loose with a wooden block and a hammer. It was necessary to drain the water out and to refill the jacket with hot water in order to loosen a particularly tight piston. This method freed the pistons after a half hour's work, where soaking them in kerosene for three days failed to do so. If the pistons are made of cast iron, the boiling water should be applied gradually.—Earl L. Botten, Boscobel, Wis.

Wood Inserts in Pulley Bushing Conduct Oil

Cutting and heating of shafts and pulley bushings is impossible if the parts, while in motion, are supplied with an abundance of good cool oil. An unfailing supply of oil may be secured to any large bushing by inserting hardwood pins, as illustrated. The pins allow the oil to ooze out as fast as it is consumed and deliver it over the shaft in such a way that the entire surface is thoroughly lubricated.


PULLEY
PIPE NIPPLE FILLED WITH MACHINE OIL
SHAFT
BRONZE BUSHING
HARDWOOD PIN
OIL CHAMBER
4 OR 6 ⅛ HOLES STAGGERED AROUND BUSHING
SET COLLAR

The Wooden Pins Distribute Oil Evenly over the Entire Bearing Surface

Hot Water for the Boat

from Engine Exhaust

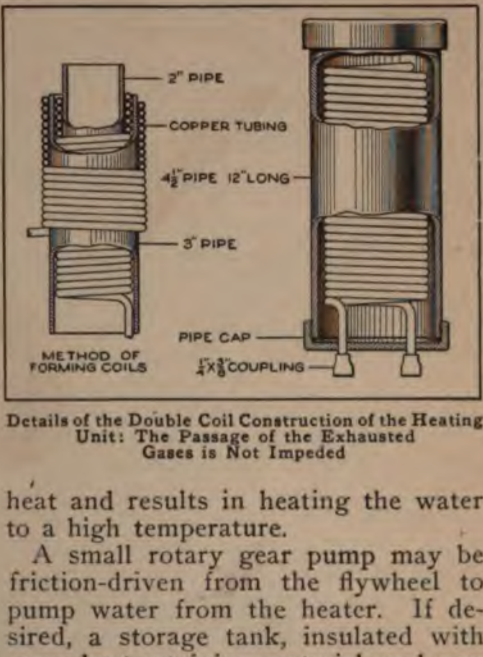
by B. Francis Dashiell

THE water heater illustrated is designed for use on small cruising motorboats, or any boat in which an internal-combustion engine furnishes the motive power and where hot water would be useful. It will provide hot water for both galley and toilet purposes, and while not under great pressure, will add much to the convenience and comfort of the craft.

The building and installation of the heater may be accomplished by anyone of fair mechanical ability and at very slight expense for the necessary materials. Inasmuch as the heat is derived from a waste product, it is operated without cost as long as the motor is in use. Heating of the coils also tends to cool the exhaust gases to some extent, resulting in an appreciable reduction of muffler noise.

The heater, as indicated in the sketch, is formed by wrapping copper tubing on a piece of 2-in. pipe to a length of about 9 in. This coil is then slipped off and placed inside a piece of 3-in. pipe. One end is brought around, and another coil wrapped on the outside of the 3-in. pipe. The pipe is then removed, leaving two coils, one inside the other, and with the ends projecting. A 4½-in. pipe, 1 ft. long, is then threaded at both ends, fitted with caps, drilled and tapped, to receive the exhaust pipes to and from the engine. Two holes must be drilled in one of the pipe ends to accommodate the two ends of the coils. If ¼-in. soft annealed tubing has been used, the two ends should be threaded and ¼ by ⅜-in. couplings screwed in.

Pipe connections should be provided which will permit the heater to be connected as near the engine as possible, to insure its getting the full effect of the hottest exhaust gases. It is also advantageous to cover the heater with several layers of asbestos, and rivet a covering of galvanized iron on top of the asbestos. This serves to retain the heat and results in heating the water to a high temperature.



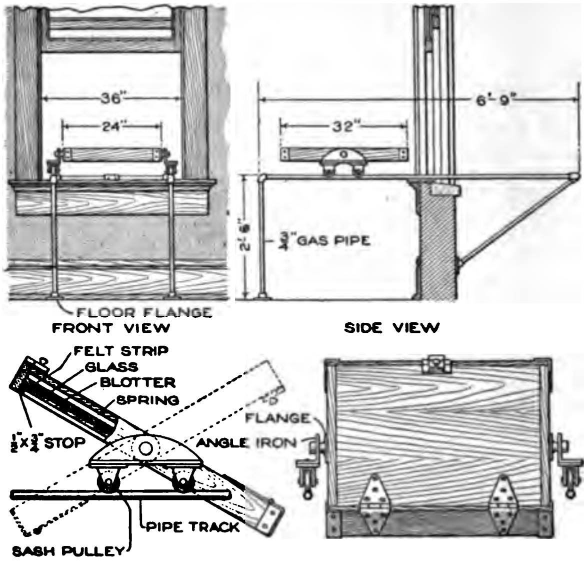
Details of the Double Coil Construction of the Heating Unit: The Passage of the Exhausted Gases is Not Impeded

A small rotary gear pump may be friction-driven from the flywheel to pump water from the heater. If desired, a storage tank, insulated with some heat-retaining material, and provided with an overflow, may be installed.

Such a tank is especially useful for fishing, picnic trips, or other excursions, where the boat would be at anchor for a period. The pump need only be run when water is desired, as the coils are not injured even if they boil dry. Wire controls may be installed to permit governing the operation of the pump from the galley or toilet.

Blueprinting Frame Has Window Carriage and Track

Constant lifting of a large frame in which blueprints are being made may be avoided by the use of a window-frame carriage and track, as shown in the illustration. With such a device the largest blueprints require little exertion in handling. The track is formed from several lengths of ¾-in. iron pipe. The rollers for the carriage are made from sash pulleys, mounted like the wheels of a railroad truck. The frame should be made from clear pine, or spruce, boards and fastened with wood screws.



Being Mounted on Rollers, the Frame is Moved with a Minimum of Lifting. It May Also be Tilted to Obtain the Best Sunlight

Improvised Veining Tool

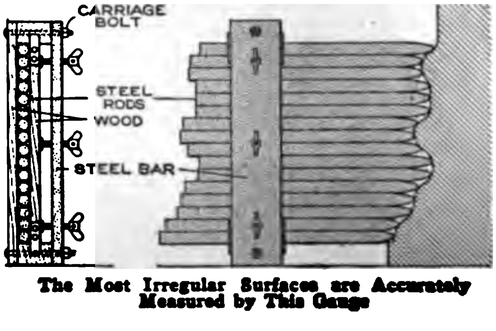
Emergency veining tools that will give satisfactory service for some length of time may be made from old umbrella ribs or steel writing pens. The parts are cut to the required length and inserted in a wooden handle. If the nature of the work demands it, the points may be sharpened or flattened as needed.—Albert Blaine, Baltimore, Maryland.

An Improvement for Electric Bells Having Small Transformers

In electric-bell installations, dry cells are being superseded to a considerable extent by small transformers. This source of power is usually stronger than a battery current. For this reason the contacts are likely to occasion trouble, a particularly important consideration in view of the almost prohibitive cost of platinum. Ordinarily, there is no need for a loud signal, and in offices, and similar places, a quiet buzzer is desirable. Under these conditions the make-and-break system of contacts was disconnected, and the magnetic coils connected directly with the circuit. As the transformer current is of the alternating type, a good signal is obtained by adjusting the vibrating armature closely at the screw contact. When so arranged, a vibration of 120 per second is obtained on the 60-cycle current. Contact troubles are almost eliminated. — John D. Adams, Phoenix, Ariz.

Homemade Gauge for Irregular Curves

Planing irregular surfaces may be accurately accomplished by the use of a gauge, as indicated in the sketch. The dimensions of this tool are determined entirely by the character of the work in connection with which it is to be used. Cold-rolled, or any other grade



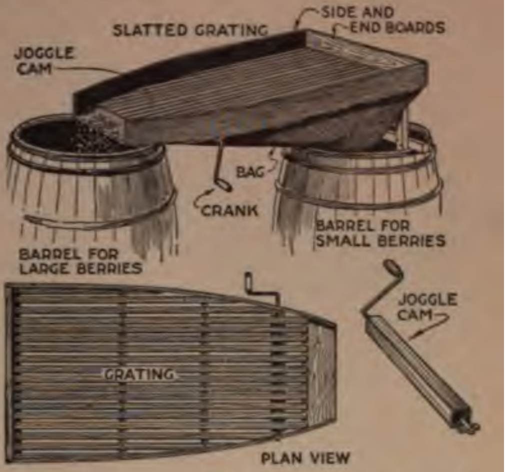
The Most Irregular Surfaces are Accurately Measured by This Gauge of steel, soft enough to be easily worked, is most suitable for its construction.

Old Cistern Remodeled as Storage Space

In one corner of a basement was a large cemented cistern, and as it was not used for its original purpose, the owner decided to make some other use of it. The cistern was cleaned out thoroughly, and a door opening was cut into it. A frame and door was fitted into the opening, and an electric light installed. The space was used as a storage for fuel, and proved quite practical.

Sorting Hopper for Berries and Small Vegetables

Berries and small vegetables bring highest market prices when sorted according to quality and size. Ordinarily this is done by hand. A sorting hopper of the design illustrated saves much tedious work and sorts the product satisfactorily. The frame is built the same as an ordinary screen, the back and sides being of 8-in. boards. It should be about 3 ft. wide at the large end, and tapered to 15 in. This forms a frame somewhat the shape of a crude rowboat. The joggle cam should be made of hard wood, while the slatted bottom may be of any material available. The distance between the slats is determined by the product to be sifted. Turning the crank rapidly vibrates the slatted section up and down, separating the large and small fruits and running them into different barrels.—L. B. Robbins, Harwich, Massachusetts.

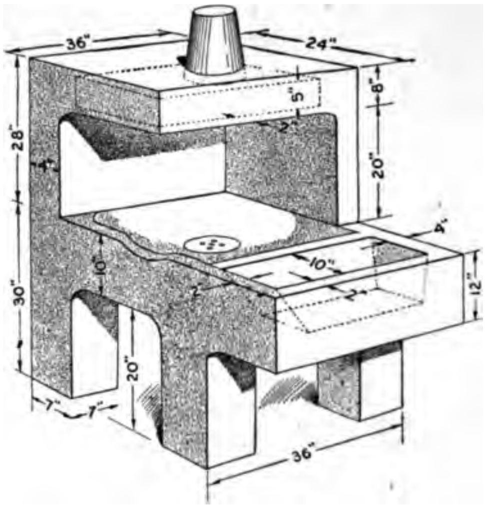


Work That would Keep Several Persons Busy for Hours is Accomplished in a Few Minutes by the Machine

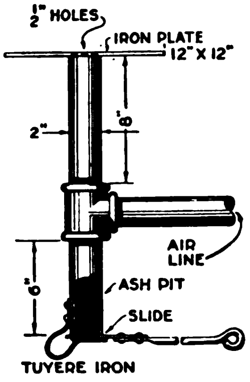
Forge of Concrete for Single or Multiple Use

One of the most recent uses of concrete is in the making of blacksmiths' forges. The multiple arrangement pictured has been in service for more than a year and has proved entirely satisfactory. A mixture of four parts gravel, two parts cement, and two of sand was used. The forms for the legs and hearth were built first. That for the hearth was built onto the leg forms, and the form for the hood was built onto the hearth form. The top of the forms of the hood and hearth was left open in each case to permit pouring and troweling. The

The Shop Equipped with Multiple Forges of Concrete Presents an Appearance of Neatness Heretofore Unobtainable center of the hearth is left about 4 in. lower than the edges. The form for the trough should be fastened together very lightly and held in position by several strips across the hearth form. A galvanized-iron bucket is set in the hood to form the base of the smokestack. The bottom of the bucket is removed after the pouring. A tuyère iron may be bought, or one made after the fashion of that shown in the sketch. Whatever type is used, it should be placed in position in the form and the concrete run around it after provision has been made for holding it in place.



Details of the Concrete Forge, Showing the Cooling Trough and Method of Installing the Flue Attachment

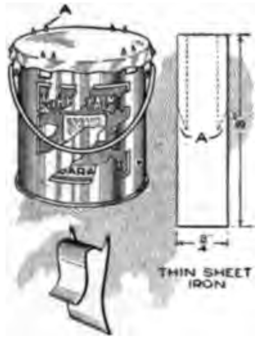


After the form is all complete the iron reinforcement is put in place. This may be made from old scrap iron, such as wagon tires or round rod. Care should be taken to see that the reinforcements connect properly. No provision need be made for expansion and contraction caused by heating and cooling. This is taken care of automatically.—Ray F. Kuns, Cincinnati, Ohio.

Pipe Aids in Removing Armature of Motor

To remove a heavy armature from a motor frame is usually an awkward job, even for two mechanics. When the central shaft is drawn through the frame and past the poles, the reach of the man at the rear end becomes short, and the dropping of the armature may result in serious damage. To carry the armature through easily, arrange a pile of blocks on the bearing base, at the side of the frame toward which the armature is drawn. Slip a 4-ft. section of pipe, fitting fairly closely, over the shaft at the rear end. This enables the workmen to get a good grip, and to remove the armature with a single lift.

Clips for Holding Straining Cloth over Can or Container



The job of straining paints, whitewash, or other liquids in the workshop, or even in the kitchen, is usually troublesome when a cloth strainer is used, because of the difficulty in holding or fastening the cloth. By the use of small sheet-iron clips made from strips of metal, shaped and bent as shown, the straining cloth can be held neatly over the top of the container. The clips are set over the edge of the vessel, and the cloth stretched as taut as desired, and pressed down so that the points A project slightly. A good feature is the ease with which the clips can be fitted to various cans and other containers.—Bert Waychoff, Fort Collins, Colo.

¶When a split bearing will serve the same purpose as well, do not use solid bearings in machines.

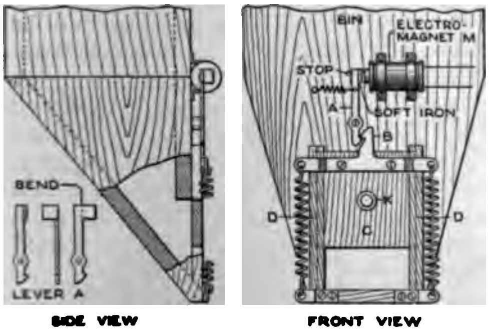
An Automatic Weighing Machine Electrically Operated

By K. M. COGGESHALL

AN automatic weighing machine has a large range of usefulness, and anyone of fair mechanical ability may construct such an apparatus to meet his particular requirements. The device illustrated is suited to every need and capacity, since the principle of operation remains the same. Grain dealers will find in it a rapid method of measuring grain; on a smaller scale the retail store can easily weigh out a hundred sacks of sugar or coffee for the stock supply in a few minutes, while even shops and factories will find in it many applications.

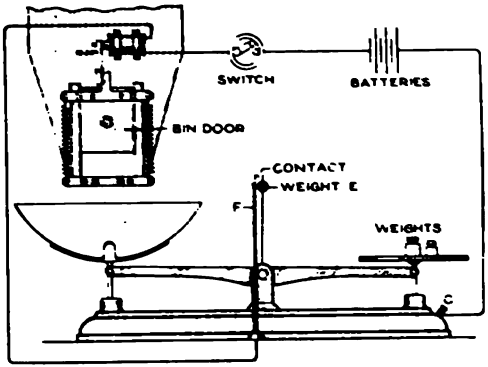
The mechanism consists of an electrically controlled drop trap and an electric switch operated by a scale balance. Two vertical runways for the door, as shown in the sketch, should be built at the mouth of the chute from the supply bin. These runways must be absolutely parallel so that the door will slide up and down them with minimum friction. A catch, B, should be cut from a strip of ¼-in. sheet iron and then screwed to the top of the door in the position shown. A knob, K, may be fastened to the door if desired, to aid in lifting it.

The pivoted lever A should be made of soft sheet iron, at least ¼ in. thick. The layout of this part is shown in the detail sketch. It may be cut out with a hacksaw, or cold chisel, and finished with a file. The square end is then bent on the dotted line, as shown, so that the flap may act as an armature for the magnet. A hole is drilled in the middle of the lower half of the lever A for a pivot. The armature should then be placed in such a position on the bin that the catch on the door C will engage the catch on the lever. A spring helps hold the armature in position.



SIDE VIEW FRONT VIEW

Diagram Showing Wiring and Details of Construction of the Electrically Operated Weighing Machine: The Point of Electrical Contact may be Adjusted to Any Designated Weight



The Supply of Material is Checked Automatically Whenever the Balance Exceeds the Specified Weight for Which the Scale is Set. The Springs Close the Door When the Electrical Contact Releases the Latch

An electromagnet should be wound with No. 18 gauge magnet wire. The size of this magnet will, of course, depend on the conditions and weight of the door drop, but after a few trials the correct number of turns of wire will be easily ascertained. The magnet should be secured in such a position that its core will be opposite, and within $^3/_{32}$ in. of, the armature, as shown in the sketch. It will then be seen that, if a current of electricity passes through the coil on the magnet, the armature will be attracted, releasing the catch B so that the springs D pull the door shut.

The electric current is controlled by a scale switch. For small weighing machines, a balance scale may be used, as shown in the sketch. A lead ball, or other heavy weight, should be fastened to the upright index finger E, so that the balance action will be snappy. Next, a metal standard, F, should be fastened to a wooden base insulated from the scale. A wire should project from near the top of the standard and across the path of the index pointer. It must be adjusted so that the index pointer will touch the wire immediate after arriving at the neutral point. Electrical connection should be made from the scale and standard, through batteries, to the electromagnet.

The operation of the weighing machine is quite simple. For instance, if it is desired to weigh up a number of 10-lb. sacks of sugar, a 10-lb. weight would be put on one scale pan. The other pan being directly below the bin door, the latter is opened until the catches engage. The instant the sugar balances the weight, the index pointer will make connection with the wire on the standard, and the door will drop, shutting off the supply of sugar.

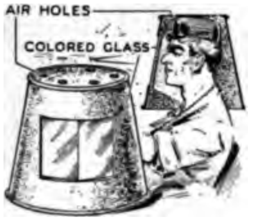
Signs on Idle Machinery Give Reasons for Delay in Production

Where there are a large number of machines in a department it is not an easy matter for the foreman to keep in mind the exact reason why any one machine is idle. An idle machine means a decrease in production and a consequent lowering of efficiency of that department. A factory has adopted the method indicated by the drawing, of placarding all machines, whenever shut down, with the reason for the delay in production. The signs are of metal, 8 in. long and 4 in. wide. If the material has been used up a "Stock" sign is placed on the machine. Other signs read, "Repairs," "Tools," "Operator," or as the circumstances may be. The superintendent, walking through the department, notes the signs and immediately takes the necessary action to put the machine bearing such a sign in operation.

Protecting the Hands from Dirt and Grease on Engine Work

By applying soap to the hands before beginning work on an automobile, or other piece of machinery, the dirt and grease are easily removed. Work up a good soap lather on the hands and as far up on the arms as thought necessary. Allow the soap suds to dry. Then scratch the cake of soap with the finger nails, so that the soap is packed tightly under the ends of the nails, and allow it to dry. The hands are protected by a film of soap that will not be removed easily unless they come in contact with water. When the work is finished the dirt can be washed off with very little scrubbing. This method is particularly good for those who do not care to wear gloves when working on machinery.

Welding Mask Made from a Metal Bucket



A serviceable welding mask may be made in a few minutes from an ordinary metal bucket. One of 3-gal. capacity is the best size. A rectangular hole, 6 in. by 4 in. is cut in its side, as shown. Over the hole two pieces of colored glass, each 3½ in. by 4½ in., are placed, so that the long edges will meet at the vertical center line of the hole. The two pieces should form an obtuse angle with each other so as to conform as nearly as possible to the curvature of the pail. The glasses are held in place by metal clips soldered inside the bucket. Several holes should be drilled in the bottom for ventilation. A hat, or cap, is worn to act as a pad for the head, the bucket being worn inverted and in such a position that the operator looks through the colored glass while welding.

¶In washing photographic prints, care should be taken that they are not creased, or the surface may be cracked.

Novel Repair for Cracked Water Jacket on Engine

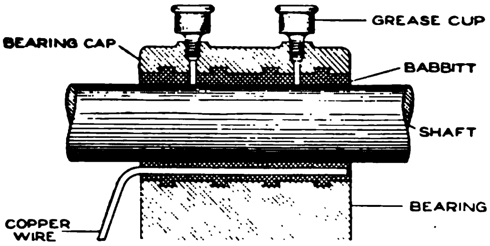
A cracked water jacket may be repaired satisfactorily as follows: Drill and tap a small hole at the end of the crack. Thread in a copper wire, or rod, and cut it off flush. Next drill another hole beside the first one, and close enough to it, so that the threads of the plug, screwed into it, will lap into the first plug. This process is repeated until the crack is filled. The heads of the plugs are then riveted, to close the small intervening spaces. With careful workmanship, this method will provide a water-tight repair that will give indefinite service.—Anthony Ottis, Bloomington, Ill.

Cements for Pipe Joints

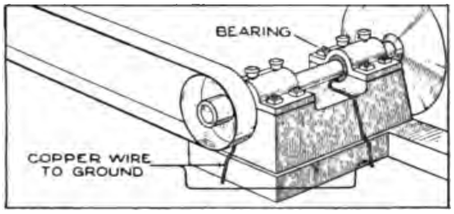
Cement for making screw joints in pipes steam-tight may be made from graphite and heavy cylinder oil. Just enough oil is mixed with the graphite to form a thick paste. A good cement for both water and steam pipes has this composition: Whiting, 4 lb.; fine yellow ocher, 10 lb.; ground litharge, 4 lb., and ½ lb. of hemp cut into fine particles. These ingredients are mixed thoroughly with linseed oil to form a paste, which is applied on the threads of the pipes and fittings. For ammonia piping, a cement made of litharge and glycerin is used. Sufficient glycerin is added to the litharge to form a putty. Only enough of this cement should be mixed to serve immediate needs, as it sets quickly. After having once set, it should not be disturbed.

Cooling Large Bearings with Grounded Copper Wires

Large bronze, or babbitt, bearings are effectively reduced in temperature, and static electricity is abolished, by connecting a large copper wire from the bearing to the ground. The heat is radiated over the wire and much of it is lost in the air. That which reaches the ground is absorbed. If the ground wire is placed in moist earth, cooling is all the more effective. The larger the diameter of the ground wire used, the faster will be the radiation of heat.



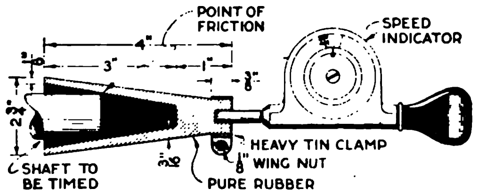
SECTION VIEW OF BEARING



Heat Created by Friction and Static Electricity is Radiated from the Bearing by a Large Copper Wire

Attachment Adapts Tachometer for Shafts without End Centers

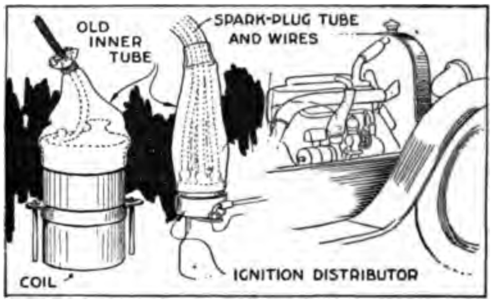
Ascertaining the correct speed of a shaft that has no end center to accommodate the speed indicator is almost impossible without registering more or less slippage. To overcome this difficulty I turned a piece of pure gum rubber to the shape of a cone, 2¾ in. in diameter at the larger end and 4 in. long. I then hollowed out the latter end and fastened the small end to the shaft of the speed indicator with a tin clamp and wing nut. To determine the speed of a shaft the cone is pressed over the end until it holds without slipping. The cone will fit any shaft from ½ in. to 2½ in.—P. P. Avery, Garfield, New Jersey.



The Rubber Cone Grips the Shaft Securely and Eliminates Slippage

Rubber Tube Protects Ignition Distributor of Auto Engine

When motoring in heavy rains, or where streams must be forded, the ignition of a car is frequently put out of commission by water getting under the engine bonnet and drenching the distributor. This difficulty may be avoided and the motor fully protected against short-circuiting, from anything short of an actual immersion in water, by capping the distributor with a piece of old inner tube, as indicated. The wires are removed while the rubber is stretched over the distributor and the end of the ignition manifold. Once in place and tied securely, all moisture is excluded.



The Distributor and Terminal Wires are Protected against Moisture by a Section of an Old Inner Tube

Machine Nuts Set on Rods with Belting as Wrench

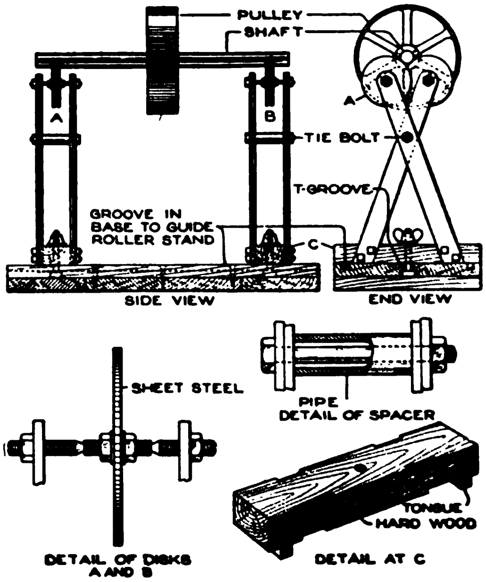
A large stock of iron rods, with threaded sections at each end, were to be fitted with two nuts at each threaded part. The nuts were to be turned down firmly preparatory to shipping the rods. To save time, I started the nuts on the threads by hand, and then set them quickly by the use of an old piece of belting, 3 ft. long. The rod was gripped in a vise, and the belting looped over the nuts near one end of it. By drawing the belting quickly around the nuts they were turned up snugly with a single motion of the belting. To have done this work with a wrench would have taken much more time.—H. G. Corbin, St. Paul, Minn.

Micrometer Used as Indicator on Work in Chuck

A micrometer can often be used to true up finished work in the lathe chuck when an indicator is not at hand. Open the jaws of the micrometer part way and clamp the frame to the tool rest with blocks of wood. Run the carriage in until the end of the micrometer handle is near the work. Slowly revolve the chuck by hand, frequently setting the handle against the work, and observe the reading to determine the eccentricity of the piece. When the reading is the same at various points on the circumference of the piece, it is centered. This method can also be used in setting up work in a milling machine or shaper.—H. H. Raymond, Newburyport, Mass.

Disk-Bearing Stand for Balancing Rotary Machine Parts

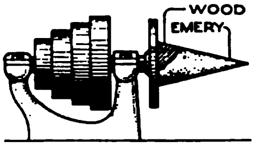
Balancing flywheels, pulleys, and similar parts, is simplified by the use of a disk-bearing stand, as illustrated. The disk-bearing surface allows the part to rotate with so little friction that the heavy portion to be trued



The Parts to be Balanced Rotate without Friction, Sending the Heaviest Portion to the Bottom immediately goes to the bottom. Material is then removed from the heavy side until an accurate balance is obtained. The disk rollers are carried on conical bearings, supported by a steel framework mounted on a base of well-seasoned hard wood. The distance between the disk rollers is adjustable for accommodation to various lengths of shafts.

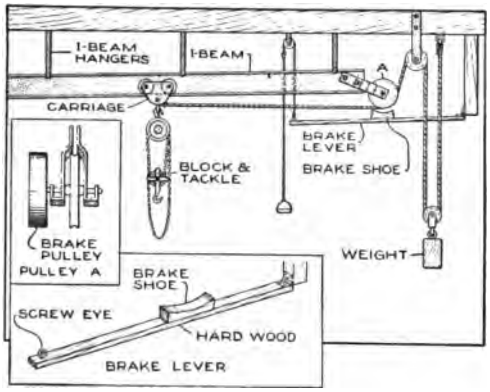
Revolving Cone for Sharpening All Sizes of Gouges

Cone-shaped emery wheels are not always provided, even in pattern or cabinet shops, and frequently I have been at a loss for a means of sharpening various sizes of gouges. Accordingly I have improvised a satisfactory cone-grinding tool from wood, glue, and emery. I screwed a piece of maple to a small faceplate and turned it down to a cone, 3 in. in diameter at the large end, and 6½ in. long. A coat of cold glue was then applied to the cone, and after being allowed to dry for a few minutes, it was sprinkled with medium emery. Once the glue was dry the device worked quite as well as a cone-shaped emery wheel. Several such cones were made up and sprinkled with different grades of emery to suit various grinding jobs. When the cutting surface is worn out, it is only necessary to resurface the cone by the application of more glue and emery. The size of the cone may be altered to suit requirements.—R. L. Martine, Shelton, Connecticut.



Counterweight Returns Block and Tackle to Loading Point

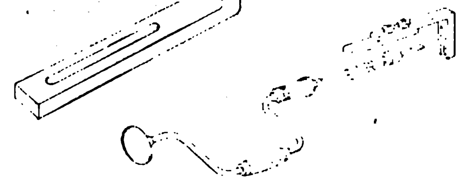
Where loads are carried one way on an incline track with a block and tackle on a carriage, the entire mechanism may be returned to the loading point automatically by a cable and counterweight, connected as shown in the illustration. The weight should be just heavy enough to return the empty carriage. The brake is provided to check the speed of the loaded tackle and carriage as may be desired.



With the Tackle and Carriage Returning Automatically When Unloaded, Work is Accomplished Rapidly

Device for Tightening Bolts Quickly with Brace

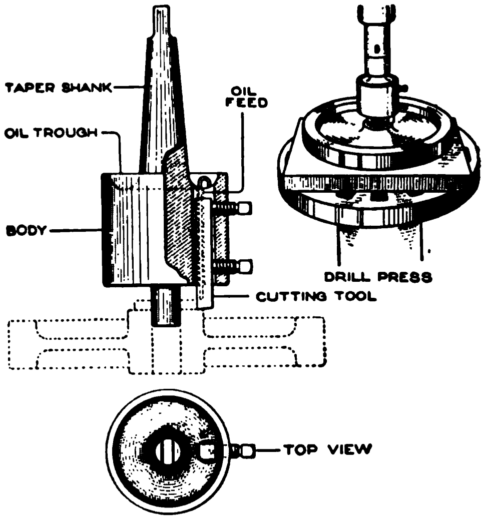
In assembling stoves and many other varieties of work where large numbers of small bolts are used a brace-attachment tool as indicated in the sketch is a great saver of time and labor. It is only necessary to start the bolts with the fingers, after which they are held and tightened practically by a single operation of the tool. A hexagon socket to be inserted in the brace permits the same application with head-cap screws.



The End of the Tool Holds the Nut While the Bolt is Sent Home with a Few Turns of the Brace

Tool for Machining Bosses and Hubs on Drill Press

Bosses and hubs for all manner of light machinery may be machined on a drill press by the adoption of a taper-shank cutting tool as shown in the illustration. Best results are accomplished in this work if the press is operated at its lowest speed. For machining bronze, aluminum, or soft castings, no oil is needed, but for any work harder than the best grades of gray iron a continuous oil bath through the top of the tool is essential to retaining a keen edge.



Equipped with This Tool, the Drill Press Machines Bosses and Hubs Accurately

Carpet Pad for Wood Planes Saves Frequent Sharpening

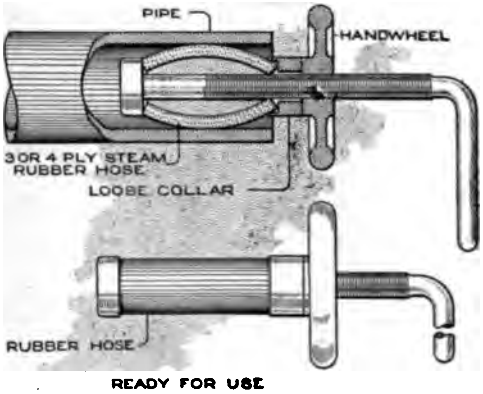
The home woodworker, who has not trained himself to be especially careful of his edge tools, finds his planes nick quickly. This is often caused by laying the plane hurriedly on the bench among other tools. A plan that will save much resharpening, and will keep the edge on the plane, is to provide a 7/8-in. board, about 10 in. wide and 14 in. long, covered with a carpet pad, on which the plane can be set. This pad may be on the bench top, or arranged as a shelf.—S. C. Lange, Detroit, Mich.

Removing Old Babbitt Metal from Bearing Boxes

Usually most of the babbitt metal can be removed from a bearing box with a cold chisel and hammer. If this procedure is not feasible, the box may be placed in a forge fire, and the babbitt melted out. The melting method is undesirable because of the probability of losing part of the metal. Where the bearing box is small the metal may sometimes be melted by the use of a blowtorch, and permitted to drop from the box into a suitable tray arranged underneath.—L. S. Sherman, Chicago, Ill.

Device for Plugging Ends of Pipes under Pressure Tests

In testing pipes, or tubing, for leaks with either water or air pressure, an end plug that may be applied or removed almost instantly is desirable. Such a plug, with a piece of steam hose as the stoppage member, may be fashioned by using the threaded combination indicated in the sketch. After being inserted in the pipe the hose is expanded with a few turns of the handle. Once placed, it forms a contact sufficiently tight for normal test pressures.



A Couple of Turns of the Lever and Handwheel Plugs the Pipe Securely

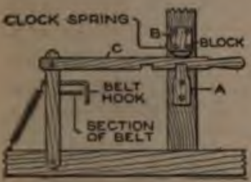
¶Interior corners of patterns are rounded off with fillets because a sharp interior corner in a casting weakens it.

Serial-Number Identifications on Working Drawings Save Time

When there are several drawings on separate sheets made in connection with a drafting job, every sheet should bear the serial number, title, date, and index, or filing, number. The best method is to place this information on the sheet as soon as the work is begun. This simplifies checking up the drawings, and makes it possible to file them so that persons unfamiliar with the drawings or subject can easily locate the sketches of the various features covered by the design, or working drawing.—William B. Johnson, Baltimore, Md.

Simple Belt Shifter with Spring Lock

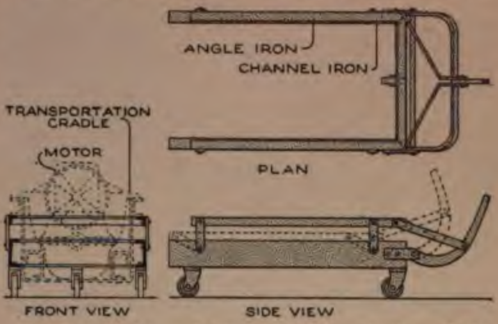
An ordinary belt shifter can be provided with a locking device, to prevent the belt from working back on the loose pulley and stopping the machine, by fitting the shifter with the arrangement shown. The method can be applied to shifters in various positions. The original shift lever is shown with the belt hook attached to it. The handle C is pivoted, with a screw, on the old shifter. An upright is fitted with a block, B, and a key, A. The key fits into notches, about 1 in. wide and ½ in. deep, cut at points slightly farther apart than the width of the belt. A section of clock spring on block B holds the handle against the key A. A spiral spring aids in keeping the belt hook in position over the loose pulley when the lock is not being used, temporarily. The shifting of the belt, and locking it securely is easily accomplished.—Robert B. Binns, Boston, Massachusetts.



¶Polishes intended for brass, or other metal, should not be used on lacquered work, unless the lacquer, which is removed, is replaced by a new coating.

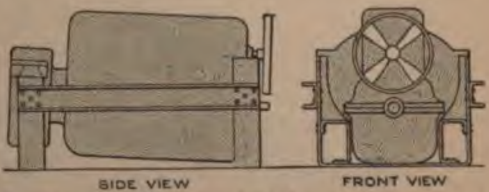
Truck with Lifting Platform and Cradle for Auto Motors

The truck illustrated is designed for use in handling automobile motors in garages and assembling plants. It consists of a main body of channel iron bent into the shape of a large "U." Three casters are set on it, one at the base of the U, and the others at each of the ends. A U-shaped bar is set on four small toggle levers that are fastened to this bar and the main frame. The bar is operated by a long lever attached at one end to the main frame and connected by a free-working lever to the small bar.



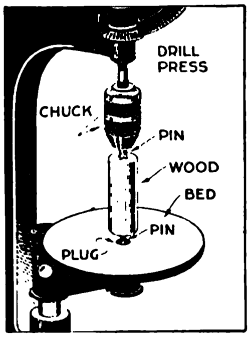
The Dotted Lines Indicate the Functioning of the Lifting Platform. The Plan View Shows Structural Details

To operate the truck it is slid under the engine-cradle side channels. Then by pulling down on the long lever the small U-bar is raised on the toggle and lifts the cradle. The linkage is so arranged that it holds the weight up while the truck is wheeled about by the same handle that raised it. In the sketch the truck is shown with the U-bar raised. The dotted lines in the two upper sketches indicate the position the platform takes when raised and lowered.



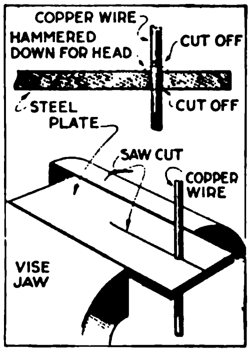
With This Truck Automobile Motors are Installed or Removed with a Minimum of Effort

Using the Drill Press as a Wood-Turning Lathe



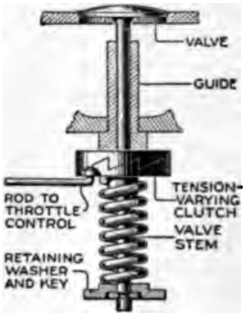
In shops unprovided with facilities for turning wood, there is frequently demand for work requiring a fairly accurate cylindrical outline. Such work may be turned out on a drill press. Two stout pins are driven in the ends as nearly in the center as possible. One of the pins is secured in the chuck while the lower one is given a bearing in one of the holes of the drill table. A suitable tool rest is provided by an ordinary machine clamp, while an old bastard file, ground off, sharpened, and provided with a handle, makes a satisfactory cutting tool. The size of work that may be turned out in this manner is limited only by the size and adjustments of the drill press. —J. S. Hagans, Toledo, Ohio.

Method of Making Copper Rivets from Annealed Wire



After finding it impossible to make good copper rivets in a vise, I contrived the method illustrated in the sketch. In a piece of steel, about 1/4 in. thick, a hole is drilled, the size of the stock from which the rivets are to be made. A single cut should then be made with a hacksaw from the end of the piece of steel to a point an inch or more beyond the hole. When the steel is put in a vise it tightens up on the stock inserted in the hole, holding it firmly while the top of the rivet is headed down and the other end cut off. Rivets of uniform size and of any desired length may be made by making a form of the required dimensions.—Melvin Snyder, Duluth, Minnesota.

Adjustable Valve-Spring Tension Adapts Motorcycle for High Speed

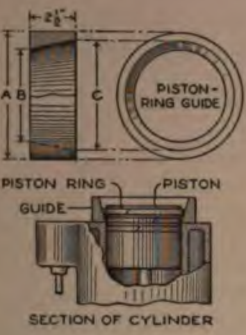


Powerful exhaust-valve springs are essential when high speed is demanded of a motorcycle, but such springs make the motor difficult to start and unsatisfactory when throttled down. By providing his machine with a ratchet tension-varying clutch, as illustrated, a motorcyclist has secured a compromise between the touring and high-speed types of mount. The ratchet is connected with the throttle control so that, as the speed of the motor is increased, the tension of the exhaust-valve springs is increased by compressing them slightly.—E. F. Hallock, Brooklyn, N. Y.

Cement Mixture for Patching Dents in Boat Hulls

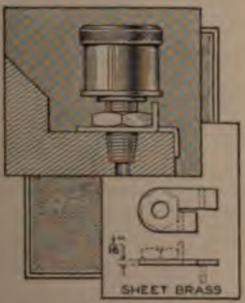
Red lead and Portland cement mixed, half and half, with oil to a putty consistency, form an excellent patching material for holes, up to the size of a silver dollar, in boat bottoms. The edge of the hole should be dry, rough, and pegged with small galvanized nails projecting slightly to reinforce the cement. The patch hardens slowly, hence it is best to do this work in winter, or while the boat is out of commission. For a quick repair, cement and water is fairly satisfactory. It is then unnecessary to have the wood dry and the boat can be used, without danger to the patch, in about two days.—Hayes Bigelow, Brattleboro, Vt.

Guide for Inserting Piston Rings in Cylinders



By the use of a steel guide having a tapered hole, the task of setting pistons in cylinders is simplified. The inside diameter of the guide, at the small end of the taper, should be exactly the same as the bore of the cylinder. The upper inside diameter should be slightly larger than the piston measurements over the rings when expanded. The guide is placed over the cylinder and the piston pressed down through the taper which compresses the rings and allows them to slide into place. A coating of heavy oil over the piston and the inside of the guide aids in the smooth accomplishment of the purpose.

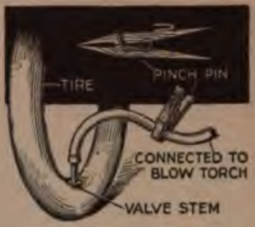
Holding a Loose Grease Cup on a Clutch



A loose grease cup on the clutch of an automobile was the source of much trouble, three cups being lost before the device shown was used to prevent it from coming loose. A strip of 1/16-in. sheet brass was inserted beneath the locknut, one end being bent up against the nut and the other against the edge of the clutch housing. The strip served as a positive lock for the nut, and the grease cup never came loose thereafter.

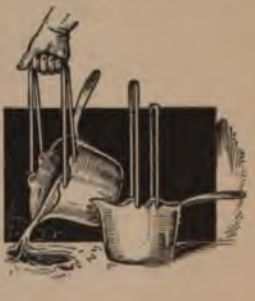
¶It is usually necessary to drill out a broken stud; hence bolts should be used wherever practicable.

Tire Used to Furnish Pressure for a Soldering Torch



When the air pump of a garage man's soldering torch failed just as he was about to begin an important piece of work he substituted an inner tube to supply the necessary air pressure. It rendered satisfactory service. The spring mechanism was removed from the valve stem, after which the tube was pumped up. A pinch pin was used to hold the air between the strokes of the pump and to retain it after filling. The end of the air hose was then connected to the pressure cock of the torch and the air released by the removal of the pinch pin.

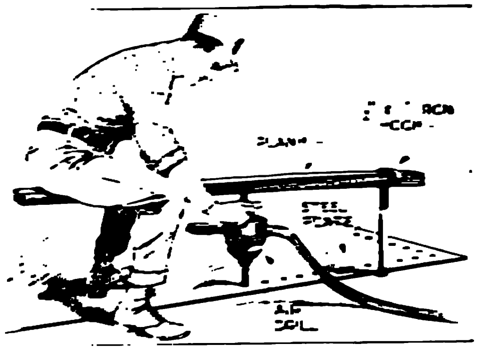
Caldron Pours Molten Metal with One Hand



Pouring molten lead, or other metal, in cramped quarters, such as pipe and electrical conduits, is decidedly awkward and even dangerous if both hands have to be used at the task. Much of this difficulty may be eliminated by the use of a double-handled caldron as illustrated. An ordinary melting ladle may be so altered. Round iron, ¼ in. in diameter, is used for the handles. The front one is so placed that the caldron will balance when picked up by it. The rear handle is 2½ in. shorter and is set 2 in. back of the other. By tightening the grip on the two bails, the caldron is tilted and the contents poured. The usual handle is left in place for use where two-handed work is convenient.—S. L. Heaps, Kewanee, Ill.

Rigging Lessens Work of Drilling Holes in Steel Plates

When drilling rivet holes in large plates of steel that cannot be handled in a press, the work is facilitated by using a hook made by bending a ½ by 1-in. flat bar, and a short plank. By placing the members as shown in the illustration, and sitting on the free end of the board, an air or electric drill is held in place under sufficient pressure to drive it through the metal. The plan eliminates the trouble attending the customary practice of placing the drill under a clamp and feeding it through the plate with the aid of a hand screw.



This Advantageous Method of Drilling Holes in Steel Plates Saves the Time Usually Lost in Using a Clamp and Hand Screw

Machines Oiled at Close of Workday Start Easily in Cold

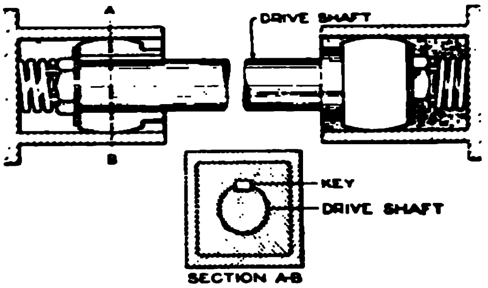
When running machinery in cold weather even hot oil, put on before starting, sometimes cools in the oil passage and does not flow to the bearing surface until undue friction warms the bearing enough to soften it. To overcome this difficulty, oil the machinery immediately after shutting down at night. The bearings being slightly warm, the oil gets to the bearing surfaces, and is ready for the start next morning, when more oil can be put on if required. This obviates the danger of getting the bearings too warm before the oil becomes heated enough to flow readily.—J. E. McCormack, Haliburton, Ont., Can.

Pipe Cutter Used to Strip Heavy Covered Cable

Having considerable weatherproof cable to cut and prepare for receiving terminals, I encountered great difficulty in removing the insulation. The hacksaw, and other tools, quickly became gummed with the weatherproofing compound. By the use of a three-wheeled pipe cutter, such as plumbers commonly employ, I was able to sever the covering quickly and smoothly. A neat groove for the hacksaw was provided, and the conductor was cut quickly with a clean saw. The cutter proved especially useful in preparing the ends of the conductor for the terminals, providing a square, clean-cut shoulder.—A. Vaughan Simpson, Niagara Falls, N. Y.

Spring End Bearings Overcome Play in Auto Drive Shaft

The drive shaft on an automobile was provided with universal joints that permitted a free lengthwise motion of the shaft, this occurring when the car was fully loaded. After a little while the inner portion of the joint housing became slightly worn, and it was not long before the shaft was sliding back and forth continuously. A spring was placed, at each end of the shaft, as shown in the sketch, and this solved the problem. The shaft thus continually floats between the two springs, and the rear-joint housing is the only part that moves when the car is loaded. Vibration is wholly eliminated.



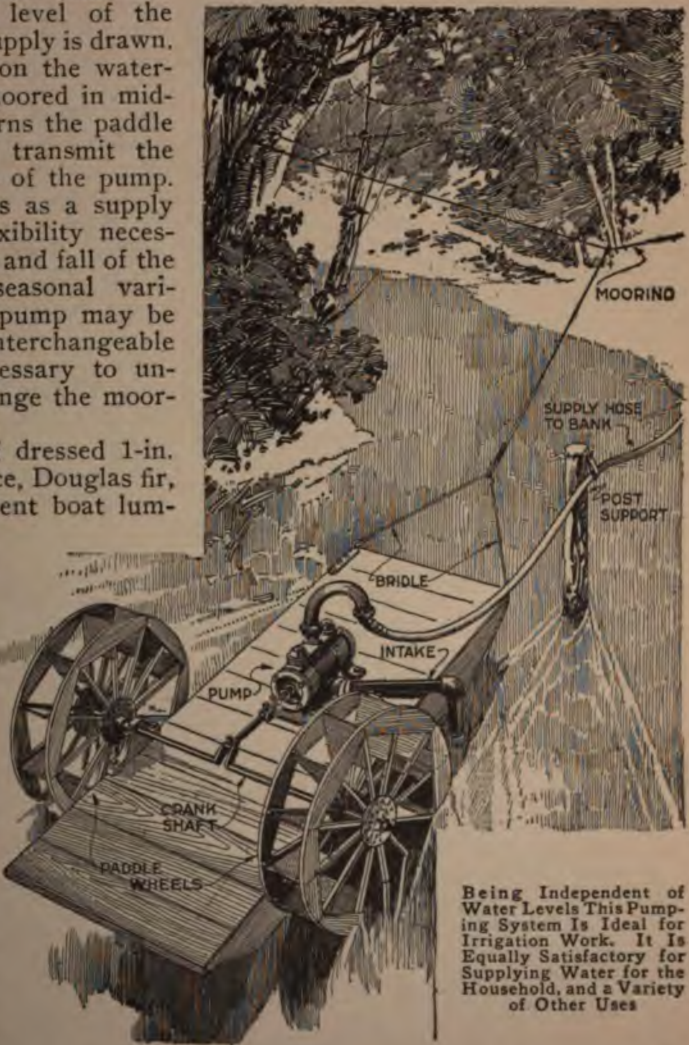
The Automobile Drive Shaft Floats between the Coil Springs at Its Ends

Hydraulic Pump Is Independent of Water Levels

By S. D. HOOPER

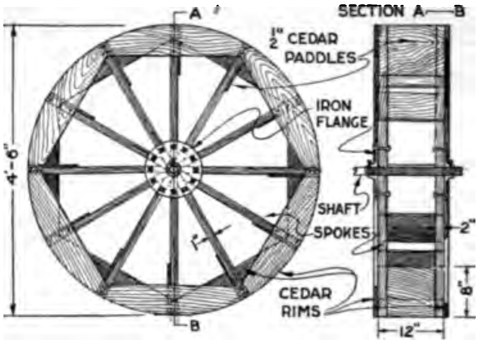
THE pumping system illustrated overcomes the limitations of water wheels and hydraulic rams due to fluctuations of the level of the stream from which the supply is drawn. The pump is mounted on the watertight deck of a barge moored in midstream. The current turns the paddle wheels, which in turn transmit the power for the operation of the pump. An ordinary hose serves as a supply line and affords the flexibility necessary to allow for the rise and fall of the stream according to seasonal variations. If desired, the pump may be used at two or more interchangeable points. It is only necessary to uncouple the hose and change the moorings.

The barge is built of dressed 1-in. stock. White pine, spruce, Douglas fir, and cedar are all excellent boat lumber. The dimensions are 12 ft., over all, beam 4 ft., and depth 16 in. The bottom boards should be tongued and grooved, and for ease of construction laid the short way. The finished boat is calked with white lead and given two coats of good paint. Galvanized-iron boat nails should be used. Ordinary wire nails will rust out.



Being Independent of Water Levels This Pumping System Is Ideal for Irrigation Work. It Is Equally Satisfactory for Supplying Water for the Household, and a Variety of Other Uses

The paddle wheels are constructed from 1-in. boards, with the exception of the blades, which are of galvanized iron or wood. These are placed about two-thirds of the over-all length aft so as to trim the boat properly. Paddles 8 in. wide will develop sufficient power for ordinary needs in a stream that is moderately swift. In a sluggish stream, or if great power is demanded, the size of the paddles should be increased according to requirements. The crank in the center of the shaft will, of course, be half the stroke of the pump piston in length. By elevating the shaft bearings the necessary clearance is provided for the crank without the necessity of making a depression in an otherwise solid and level deck.



Construction Details of the Paddle Wheels: The Metal Fitments Are Few and Simple. They may be Made in the Home Workshop or Purchased at Any Machinery Supply House

There are a number of pumps that might be adapted to this use, but the most satisfactory one, and the one that will meet most requirements, is the usual tank pump which is ordinarily operated by means of a vertical lever. Such a pump is obtainable at any well-stocked supply house. The pump illustrated has a capacity of 1,000 gal., that is, it will throw 1,000 gal. of water an hour to a height of 20 ft., with the paddle wheels turning 100 revolutions a minute. Details of the pump, and the paddles that will be needed to operate it, are, of course, decided by the conditions under which the system is to be used.

The supply hose should be supported by a stake or stakes driven in the bed of the stream, or by slings from any convenient overhanging limbs. Careful attention should also be given to the barge moorings. There should be plenty of line to allow for fluctuations of the water level, and the stability of the barge will be increased if the line is attached as shown in the illustration.

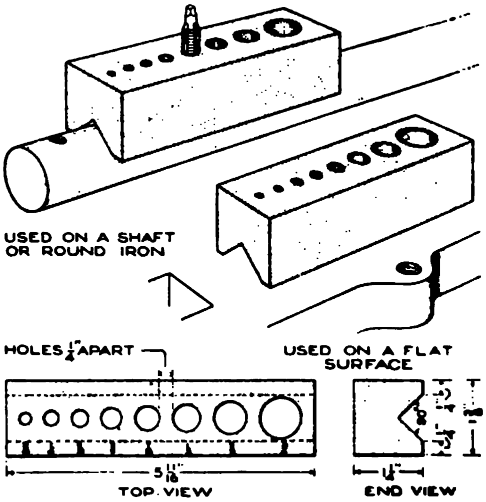
Once well placed, the system will require little attention. If there is any doubt as to the tightness of the hull, an excellent precaution is to fit an auxiliary intake of gas pipe leading to the floor of the hull. This should be provided with a shut-off valve, which is opened if it becomes necessary to bail out the boat.

An Economical Type Gauge

Printers not possessing a standard type-high gauge will find a convenient and accurate substitute in an old screw composing stick. By setting the knee of the stick to a large type the stick may be used as a gauge, the etching entering far enough into the jaws to insure accuracy. A mark should be made at the point where the type sticks fast to the jaws, and this mark used to gauge the cut. The stick may also be used as a caliper.—George Parke, Mount Morris, Ill.

Blocks for Starting Taps Squarely

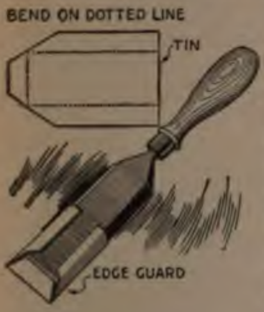
Cutting female threads is often difficult because of the tendency of the tap to take a bad start. By the use of a steel tap guide, as illustrated, faulty starting of the threading tool is impossible. The tap is held in correct



If the First Few Threads are Cut Properly the Others Follow Their Lead alinement until the first three or four threads are cut, after which the guide may be removed. This tool is especially useful in tapping threads in shafting, or any other round surfaced stock.

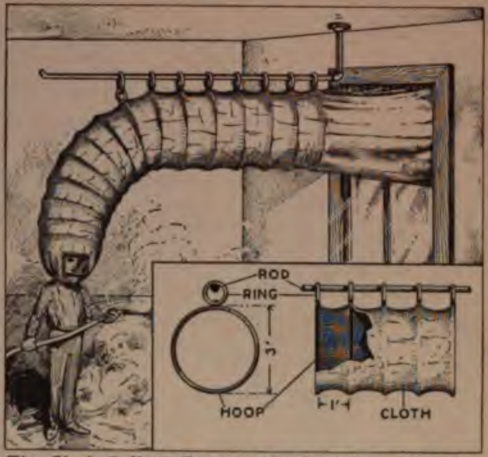
Tin Guards for Edges of Chisels

When wood chisels are properly guarded, much time can be saved in resharpening because the edges are not nicked from contact with other tools, on the bench or in the tool box. Metal guards, as shown in the sketch, were found superior to leather ones. They can be made easily from light tin, or sheet metal, cut to the shape indicated and folded on the dotted lines. The upper portion of the guard must clamp the chisel closely, so that the cutting edge cannot be forced against the guard under ordinary conditions.—H. A. Trester, Milwaukee, Wis.



Air-Bellows Device Protects Sand-Blast Operators

One of the most effective as well as easily contrived devices for protecting sand-blast workers from breathing sand-laden air, is the hoop and bellows combination illustrated. It is very light, being made of heavy muslin, or other close-woven cloth. The hoops are made of light reeds, and the first eight of them are hung by means of rings to an overhead bar so that they can be drawn back and forth. There should be sufficient slack to enable the workman to move freely. A glass window is fitted into a light steel frame through which the operator is able to observe his work. The lower section is provided with a draw string which is pulled up until the cloth fits snugly about the neck. Thus equipped one is fully protected against the sand, and breathes only the air that is brought in from the outside.—Alfred J. Bell, Detroit, Mich.



The Cloth Bellows Protects the Sand-Blast Operator and Gives Him Ample Freedom of Movement

Towel-Rack Improvement Keeps Articles in Place

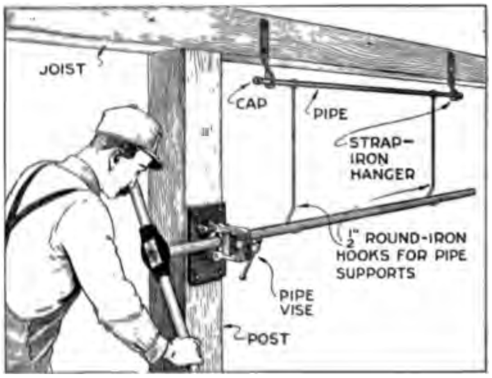
An ordinary metal towel rack is usually a source of annoyance because the towels slip off onto the floor unless carefully hung or the ends balanced. This difficulty may be overcome by soldering a row of copper studs along the top of the rail, as illustrated. A piece of heavy wire should be used. It is first soldered to the rail and then snipped off to ¼-in. lengths. A file is used to dress the points off slightly. If the studs are placed about 1 in. apart over the length of the rail, every towel will remain in the exact position in which it is hung. A coat of nickel-plate will improve its appearance.

¼ COPPER WIRE SOLDERED ON RACK AND TRIMMED OFF WITH FILE

A Row of Studs Soldered along the Top of the Rack Prevents the Towels from Slipping Off

Hook Supports for Threading and Fitting Long Pipes

Plumbers and steamfitters frequently experience difficulty when working on long lengths of pipe because of the tendency of the long end to sag and strain the pipe vise. By providing a set of hooks, as shown in the illustration, the longest pipe may be held in the vise in an absolutely horizontal position. It will be noted that these hooks are swung on a length of pipe which is held in two straps of iron bolted overhead. Ordinary pipe caps are fitted to the ends of the supporting pipe to retain it in its fastenings. This device is invaluable for shop use, and it is not so bulky but that it may be thrown into the truck or wagon and moved from job to job.—Ross A. Williamson, Memphis, Tenn.



The End of a Long Pipe is Supported by the Hooks When the Other End is Placed in the Pipe Vise for Threading or Fitting

---

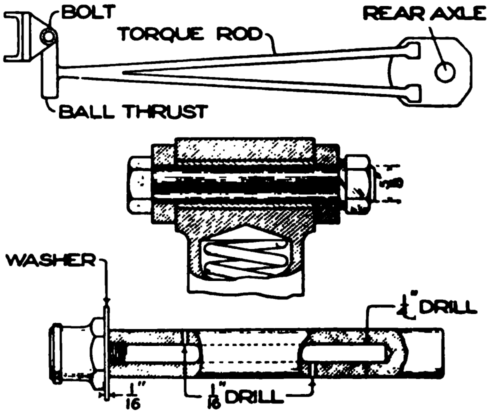
Preventing Casehardening in Dressing Circular Saws

In a small establishment, when hand-filed woodworking saws were sent out to be gummed on an emery wheel, they came back so casehardened as to be very difficult to file at first. Finally a saw sharpener was found, who gummed them without the casehardening. His method was to go around the saw in the usual manner, then go around again once or twice, just touching each tooth enough to remove the outer surface, but not enough to leave a heated surface. In finishing, he imitated the action of high-class automatic filing machines, and no casehardened surface remained on the finished saw.—J. E. McCormack, Haliburton, Ont., Canada.

Lubricating Bolt of a Ball Thrust on a Torque Rod

The bolt carrying the ball thrust of the torque rod on my automobile had no lubricating means provided, so the thrust housing was continually jammed, and consequently could not move when the rod gave under the load. I decided to make this bolt self-lubricating and did so in the following manner:

The head of the bolt was first cut off, after which a deep $\frac{1}{4}$-in. hole was drilled into the bolt, as shown. Two small $\frac{1}{16}$-in. holes were next drilled at right angles to the large hole. The grease-cup head of an old spring-shackle bolt was fastened to the headless bolt, and a $\frac{1}{16}$-in. steel washer placed next to it. Ordinary white lead was smeared over the threaded projection of the grease cup to insure a permanent fit. A constant flow of grease was provided to the bearing and all the trouble eliminated. The resulting decrease in wear was also appreciable.—L. Kline, Chicago, Ill.

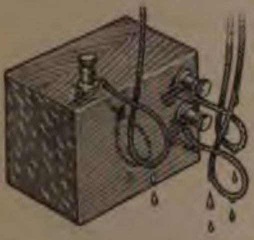


Applying a Grease Cup to a Bolt on the Torque-Rod Ball Thrust of an Automobile

Etching a Hole through Hardened Steel

When it is desired to cut a hole through hardened steel, which turns the edge of ordinary tools, a good substitute is to etch the hole through. Cover the steel with melted beeswax; when thoroughly coated and cold, make a hole in the wax with a fine-pointed needle, or other tool, the size of the hole required. Put strong nitric acid upon it; after an hour rinse it and apply more acid, repeating the process until the hole is cut as desired.—William A. Lorence, Richmond Hill, N. Y.

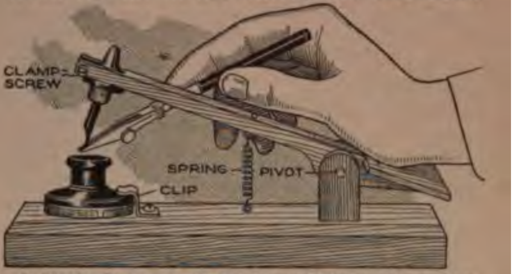
Method of Protecting Terminals from Moisture



Where electric wires are exposed to the weather and run downward to a transformer, or other instrument, trouble is frequently experienced, because the water that runs down the wire seeps in at the terminals, causing short circuits and other damage. This may be prevented by making a loop in the wires as shown in the sketch. The moisture will then run down the wire and drip off at the base of the loop. Motorists whose cars are in use in all weather will find this a useful kink if applied to spark-plug wires that are in the habit of giving trouble.

Ink-Bottle Stopper Lifter Saves Draftsman's Time

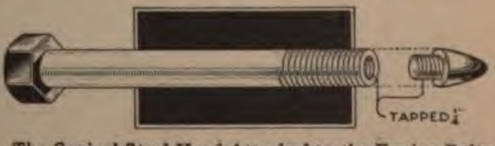
India ink dries so rapidly that, if the bottle is not kept corked between dippings, the ink quickly becomes cloudy and useless. I have overcome this difficulty and am saved the annoyance of removing the stopper for every inking of the pen by contriving an inkwell, as indicated in the illustration. The device is made almost entirely of hard wood, and the few metal fittings it contains are obtainable in any shop scrap heap. With it the ink is protected from the air at all times, and one hand only is required for inking the pen.—George A. Luers, Washington, D. C.



A Slight Pressure of the Hand Brings the Inking Quill into Position

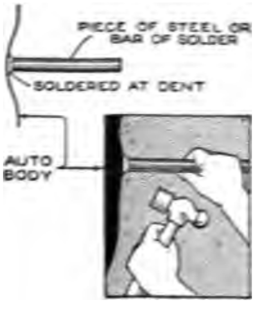
Conical Points for Engine Bolts Simplify Motorcycle Repairs

After a motorcycle engine has been removed from the frame there is difficulty in replacing it because the crankcase bolt holes do not line up with the holes in the lugs of the frame. This is avoided and much valuable time saved by fitting the engine bolts with a removable conical head, as illustrated. A hole is drilled in the end of each bolt to a depth of ¼ in., and is threaded with a female thread. The conical head is then turned on the lathe and provided with a male thread to fit into the socket of the threaded end of the bolt. The base of the conical head, being exactly the same size as the body of the bolt, is attached and driven through the parts without the slightest danger of the external threads of the bolt being injured. When the bolt is pounded through as far as it will go the head is removed and attached to the next bolt.—J. A., London, England.



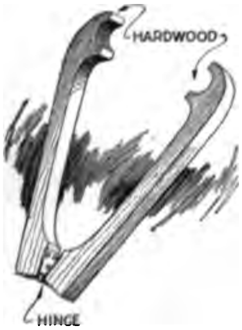
The Conical Steel Head Attached to the Engine Bolts Enables the Motorcycle Repairman to Fasten a Motor in the Frame Regardless of the Alinement of the Bolt Holes

Removing Dents in Auto-Body Panels and in Tanks



Automobile bodies often become dented, and the motorist is at a loss to devise a practical method for removing the dents. One method which has been found useful in such cases, and which the mechanic can also apply in removing dents from tanks, cans, and other sheet-metal constructions, is shown in the sketch. A piece of steel rod, or a bar of solder, is soldered at the dent, as indicated. The dented area is tapped gently with a hammer, and a strong pull is exerted at the same time on the bar. Unless the metal is heavy, the dent can be removed with very little difficulty.—Otto Kraft, Chicago, Ill.

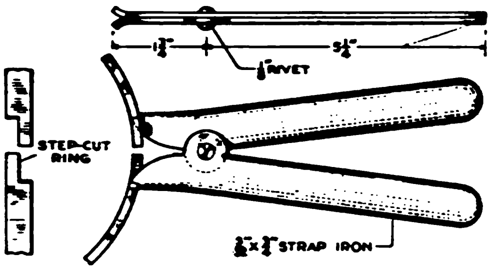
Tool for Removing and Applying Fuse Blocks Safely



To eliminate the danger of removing and applying high-voltage fuse blocks by the conventional plier, or screw driver, method, I have provided myself with a wooden tool, as indicated by the sketch. Hickory, ash, or any other hard wood, is best adapted for the purpose. The notches for getting hold of the block are cut out so they will fit any fuse down to 500 volts. Wrapping the handles with friction tape will also help to insure the user against possible shocks.—P. E. Ridings, Tarkio, Mont.

Tool for Removing Step-Cut Piston Rings

Step-cut piston rings may be removed quickly, and with little danger of breaking them, by the use of the expanding tool illustrated. Pressure exerted on the handles forces the jaws outward, and when the nose of the tool is pressed into the steps of the ring the desired result is accomplished. In using the tool one should provide himself with four strips of heavy-gauge tin, or copper, about ½ in. in width and the height of the piston in length. As the ring is expanded, these are worked under and around the piston. After two strips have been placed under the ends of the ring and the other two worked around to equidistant points on the piston, the ring may be slipped off over the piston head without further difficulty.



The Jaws of This Tool Work Like Those of a Curling Iron, and When Inserted in the Steps of a Piston Ring Expand It to Permit Quick Removal

---

Concrete Flywheels for Light Foot-Power Machinery

Concrete flywheels for many varieties of light machinery are quite as satisfactory as cast wheels costing from 15 to 20 times as much.

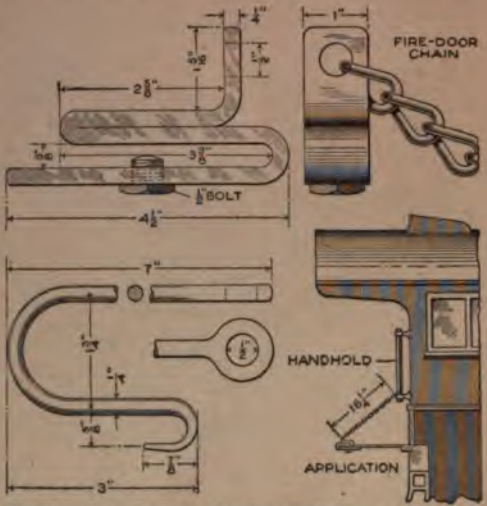
The thickness of the wheel is determined by the width of the belt to be used, and the diameter by the speed that is to be given to the driven pulley. A cheese box may be used as a mold if it happens to be of the desired size, or any thin wood may be bent to the correct form and fastened to a board with triangular brackets nailed to the outside. The greatest care must be taken to have the circle as near perfect as possible; otherwise the wheel will not run true. The mixture used should be one part Portland cement to five parts of clean, fine sand.

The wheel should be cast around the shaft upon which it is to be used, and great care must be used to have the shaft exactly in the center when the concrete is poured. Two holes are drilled in the shaft about a quarter of an inch apart and at right angles with each other, into which are driven steel rods, about 8 in. in length. These rods will be gripped by the concrete and hold the wheel and shaft together as if they were one piece. This is important, inasmuch as there is a heavy strain on the wheel, and a breaking flywheel is as dangerous as an exploding gun barrel.

Care must also be used to set the shaft square with the face of the wheel so that it will run true. A square with a long blade should be applied all around the shaft, and the shaft shifted until it is as accurately placed as possible. No matter how carefully the mold has been set for the outer edge, it should be gauged as to its distance from the shaft when the latter has been set. If the shaft is out of center, the wheel will wobble, causing violent vibration. After being completed and set in place, the surface of the wheel can be greatly improved by the application of a coat of good belt dressing, rubbed well into the pores and the surplus removed.—Kinsley Greene, Cliffside, N. J.

Locomotive-Apron Holder Aids Quick Coupling

Delays and inconvenience are frequently caused in coupling and uncoupling locomotives to and from the tender because the apron drops down below its horizontal position. This may be prevented by the installation of the holding device shown in the sketch. It consists of two clamps of the size and shape illustrated. Each clamp has a setscrew for tightening it on the apron for safety. Attached to the clamps are 16¼-in. lengths of $\frac{5}{32}$-in. chain, which hook at the other end to the cab handholds. The parts are inexpensive to make, and besides saving much time and aggravation, will prevent many injuries to fingers.

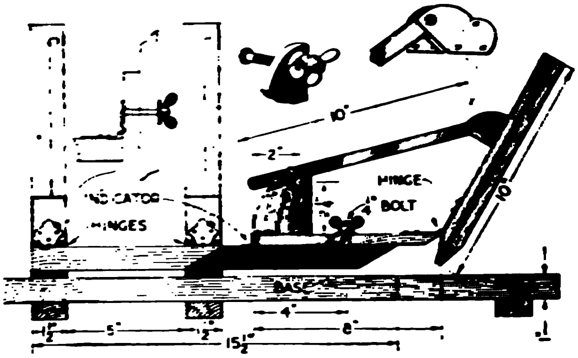


Details of the Locomotive-Apron Holder with Sketch Showing the Manner in Which It Supports the Heavy Part While the Engine is being Coupled or Uncoupled

Wooden Miter Box with Many Uses

Handling a considerable amount of mitered work, with double angles and odd joints, made necessary a miter box in which these various cuts could be made readily. In working out this problem the result was a homemade wooden miter box, which does every service of an ordinary, expensive metal and wood machine, and much other work not possible on the usual type of miter box. It was built largely of wood, as shown in the photographs, and detailed in the working drawing. The base was made of 1-in. hard wood, sup-

View of the Miter Box in Use, Showing the Adjustable Guide and the Slotted Uprights ported on cleats. At the back of the base are mounted two vertical supports, slotted to receive the sliding pieces which are hinged to the piece that covers the work being sawed. The work is placed on the base, back against the uprights, and the cover piece, which supports the adjustable gauge and guide, is placed over it, the proper adjustment being made at the wing nuts on the uprights.



Details of the Construction, Showing the Clamping and Pivotal Features of the Saw Guide and Gauge

Adjustment for the various angles on the horizontal surface is made by pivoting the saw guide around its center, and clamping it at the wing nut. The adjustment for angles of cut from the vertical is made by means of the hinged saw guide and the clamping bar at the back of the guide. This bar is made of a strip of iron, pivoted at its upper end between two galvanized-iron angles. Its lower end rests on a washer cut to receive it, as detailed, and is clamped firmly by means of the wing nut. The range of adjustment, as is evident from the detailed drawing, covers a wide angle, and can even be extended by enlarging some of the parts.

Under View of the Cover Piece and the Guide, and Specimen Cuts

Testing Knife-Switch Contact Blades

It is important that knife-switch blades, especially the large ones, should make good contact in the jaws. A poor contact will cause the switch to heat and produce corrosion that will eventually destroy the blade. Any thin, hard material may be used for making a "feeler," by the use of which one may determine the condition of a contact. A piece of mica, 3/8 in. wide and .003 in. thick, or a piece of sheet steel of the same dimensions, is satisfactory. To use this tool it is inserted between the jaw and switch blade at different points. If it can be pushed in readily the contact is poor. This may be corrected by light hammer blows on the sides of the jaws. This repair is only temporary. To make a perfect contact, the switch should be ground in with vaseline and fine pumice.—R. L. Berge, St. Louis, Missouri.

Balancing Rotating Machine Parts by Drilling

In spite of careful machine work, rotors made in a shop where there was no machine for balancing machine parts precisely were found to be slightly out of balance. This was remedied by mounting the rotors on a pair of parallels, having knife-edges. After the light side had been determined, a small hole was drilled in it, and a pin inserted. Washers were put on the pins until a balance resulted. The amount of metal to be removed from the opposite side by drilling small holes was thus determined accurately, and the exact point at which this could be done handily was also found.—Clarence Anderson, Worcester, Mass.

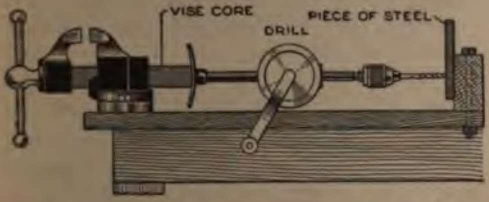
¶Where numerous nuts are used on a machine, it is desirable to have them fitted by a single wrench, or at least that they are of standard sizes.

Lead Mallet Head Cast Securely on Pipe Handle

Most machine shops have use for a babbitt, or lead, mallet, which may be used on polished metal parts. A good form of such a mallet is that having the head cast around a pipe handle, the end of the pipe being spread to lock it in the lead. A pattern for the head is made of wood, on a lathe. A suitable length of 1-in. diameter gas pipe serves as a handle. A mold for the head is made in sand, in the usual manner, and the pipe placed in position, in the mold. The metal is then poured in, imbedding the handle firmly.

A Vise and Breast Drill Used as a Substitute Drill Press

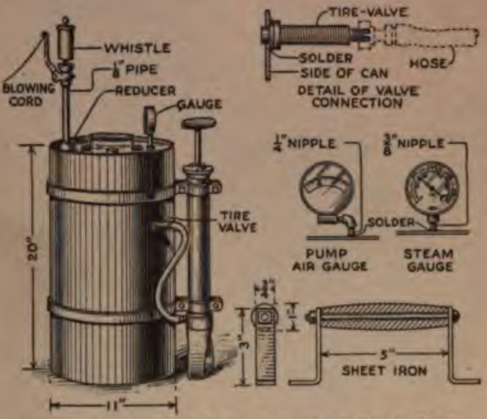
Having to drill a number of holes in pieces of ½-in. steel with no drill press available, the work was tedious. The necessity of bearing heavily against the brace of a breast drill made frequent rests unavoidable. To overcome the difficulty, a block of wood was bolted to the bench, 18 in. from the vise, which happened to be of the swivel type. The piece of steel to be drilled was then brought into place in front of this. The point of the drill was properly centered and its arm brace at the other end was placed against the moving core of the vise, as shown in the sketch. By turning the drill with the right hand and tightening the vise with the left as the drill penetrated the steel, a constant pressure was easily maintained. The holes were drilled rapidly and with comparatively little labor.—Russell Wilson, Detroit, Mich.



By Combining the Vise and Breast Drill, the Action of a Horizontal Boring Machine was Secured

Loud-Sounding Air Whistle for Camp or Motorboat

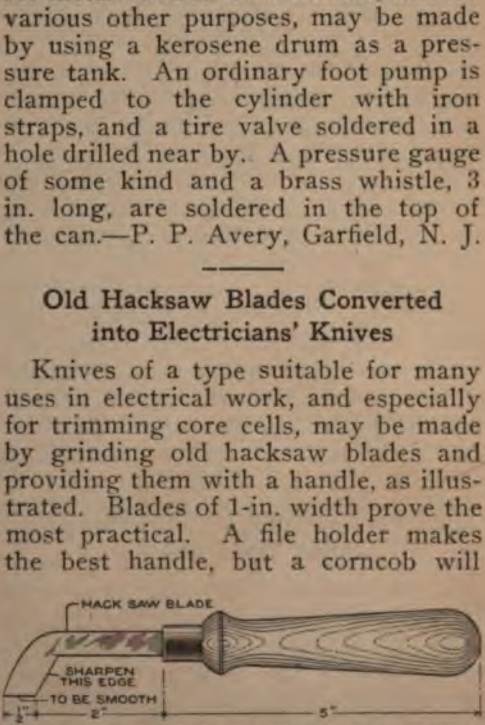
At slight expense and with little work a portable air whistle, suitable for installation in a motorboat, and for various other purposes, may be made by using a kerosene drum as a pressure tank. An ordinary foot pump is clamped to the cylinder with iron straps, and a tire valve soldered in a hole drilled near by. A pressure gauge of some kind and a brass whistle, 3 in. long, are soldered in the top of the can.—P. P. Avery, Garfield, N. J.



Showing Details of Construction of Siren Made of Kerosene Drum, Tire Pump and Gauge, and Brass Whistle

Old Hacksaw Blades Converted into Electricians' Knives

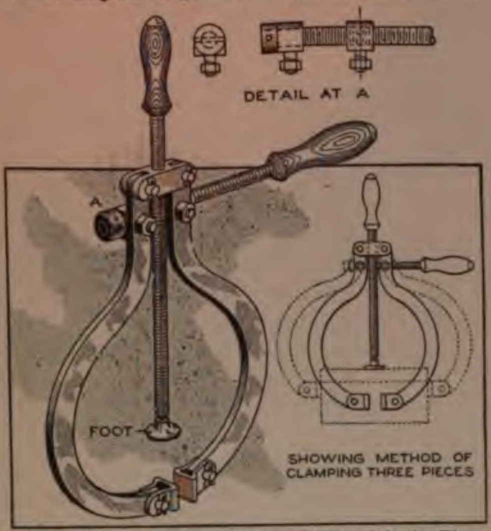
Knives of a type suitable for many uses in electrical work, and especially for trimming core cells, may be made by grinding old hacksaw blades and providing them with a handle, as illustrated. Blades of 1-in. width prove the most practical. A file holder makes the best handle, but a corncob will serve the purpose quite well.—R. R. Dilenschneider, Fremont, Ohio.



For Scraping Insulation, and for Many Other Electrical Uses, Hacksaw-Blade Knives Are Useful

Three-Way Hand Clamp Has Many Uses

Where three pieces of material must be clamped together at the ends, as is frequently necessary in pattern making, a three-way clamp, as illustrated, is a most convenient tool. Such a clamp is not difficult to make if one is able to obtain two old single-screw clamps which may be dismantled to secure the desired screws. The arms are of cold-rolled stock, while the fittings may be of any grade of steel soft enough to be readily worked. The joint A is the most difficult part to make, hence for the sake of clearness, a detail of it is shown in the sketch. No dimensions are given, as these must be determined by one's requirements.



When Clamping Three Pieces of Material, the Piece in the Middle is Prevented from Sliding Out by the Adjustment of the Central Screw

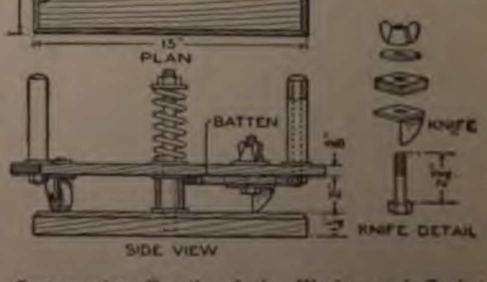
---

Novel Method of Machining Slot in Hard Casting

It was found necessary, in a shop having rather limited facilities, to cut a slot in an unusually hard casting. A novel method was employed with satisfactory results. A hole was burned in the casting by means of an oxygen torch. The hole was filled with molten brass, and the slot machined readily in this metal.

Homemade Machine for Cutting Washers and Packings

The machine illustrated enables anyone to cut large pump washers and packing gaskets accurately. It is especially useful to plumbers and steam fitters. The knife is fastened on an arm which rotates on a pivot while held down against the baseboard by a spring and with the opposite end supported by an ordinary caster. The base is of hard wood and its edges are beveled. The knife fastenings are located in a slot to permit adjustment for cutting various sizes of washers. The mounting and operation of the knife are shown in the detail. In cutting a piece of leather, or packing material, it is first punched with a ¼-in. hole. The knife and fastenings are removed and the stock is placed over the bolt. Several thumb tacks are used to hold it in place. After being replaced the knife is adjusted to the distance that will give the desired size and the handles are rotated from left to right. The washer will be cut in a smooth, true circle. Considerable pressure may be needed on heavy leather. The knife should be fastened in the block so as to be readily removable for sharpening. —L. B. Robbins, Harwich, Mass.

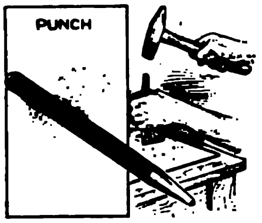


Construction Details of the Washer and Gasket-Cutting Machine Which Cuts These Parts Quickly and with Absolute Accuracy

Washing Off Pencil Tracings after Blueprinting Saves Cloth

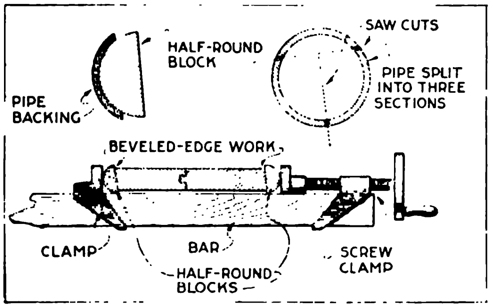
A goodly saving in drafting supplies may be effected by making drawings of a temporary nature, such as foundation plans, bills of material, preliminary surveys, etc., on tracing cloth with a soft pencil. After the required number of blueprints have been made, the drawing is washed off the cloth entirely with gasoline, and as soon as it is dry, this taking only a few minutes, the cloth is ready for the next drawing. A piece of tracing cloth used in this manner, if carefully handled, is good for 15 or 20 drawings. Use a soft rag or piece of cotton waste to apply the gasoline.—Roy H. Poston, Flat River, Mo.

Center Punches Made from Old Rat-Tail Files



Serviceable center punches may be made from worn-out and discarded rat-tail files by grinding off the ends and shaping them on an emery wheel. After being ground, the upper end should be softened slightly by heating to a dull red and allowing it to cool slowly. The intermediate file surface should not be removed, inasmuch as it aids the workman in holding the punch.

Half-Round Blocks Aid in Clamping Beveled-End Work

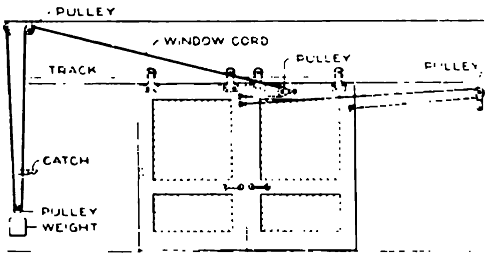


The Blocks of Half-Round Hard Wood Make Beveled-End Work Easy to Clamp

A few short pieces of half-round hard wood of various sizes are useful for beveled-end clamping operations, as indicated in the sketch. They may be used in connection with all work where the bevel is slight. These blocks are also useful in cases where wide work has to be clamped under heavy pressure and the bar is sprung. The half-round blocks automatically adjust themselves to the deviation and transmit the pressure uniformly. Where a great deal of such clamping is done, or the work is heavy, it is often desirable to make half-round blocks with a steel back. These may be formed by splitting a short piece of pipe into three sections and gluing a piece of half-round block into each section. Convenient lengths for these blocks are 3, 4, and 6 in. The pipe backs should be about an inch shorter than these lengths.

Pulley Arrangement Is Helpful in Operating Double Doors

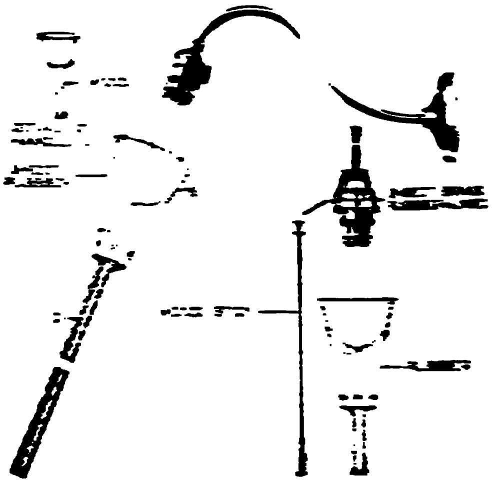
To keep the sliding double doors of a garage, or barn, tightly closed and also to enable a person to open both of them simultaneously, the pulley-and-weight system explained by the drawing has been found satisfactory. When wishing to enter or leave the building without opening both doors, the one at the right should be used, for it slides easily and does not actuate its companion.—Robert L. Cook, Madisonville, Ky.



By the Use of Pulleys and Weights Both Doors are Opened or Closed Simultaneously and with Little Effort

[illegible]

[illegible]



[illegible]

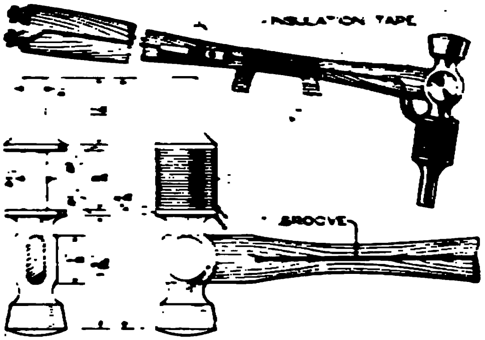
[illegible] shaped at one end as shown in the detail sketch. The [illegible] engages the globe when the tool is in operation, is made from any heavy sheet rubber. With these tools globes high up, or on a drop cord, may be removed or replaced with little exertion, and with the usual dangers of such work wholly lacking.—J. C. McDonnell, Toronto, Ontario, Canada.

Broken Slate Instrument Panel Repaired with Angle Iron

After an expensive slate instrument panel had been drilled for a large number of instruments, thus adding to its original cost, the panel was accidentally thrown to the floor, breaking across the middle. A satisfactory repair was made by bolting angle irons the full length of the panel and across the break. This made the panel as strong and serviceable as if unbroken. After the crack had been filled and polished, even the break was hardly noticeable.

Magnetic Tack Hammer Is Electrically Operated

[illegible] difficulty in driving small tacks with an ordinary magnetized hammer because it would always [illegible] several tacks when [illegible] I constructed the electrically operated hammer illustrated. I first procured a piece of soft iron and turned it as shown in the diagram. Two holes were drilled in the flange [illegible] enough to admit a [illegible] gauge magnet wire, and the magnet was then wound. Two slots were cut in the handle to accommodate the wires leading from the binding posts placed at the end of the handle. [illegible] magnet coil I used a 2-in. length of brass spring stock to form the switch A. This was attached to the handle by small screws. The handle and magnet coil of the finished hammer were wound with insulating tape and given a coat of shellac. Two dry cells and a length of flexible cord supply the current, which may be applied or broken as desired by the use of the switch.—Marion J. Teachout, Martville, N. Y.



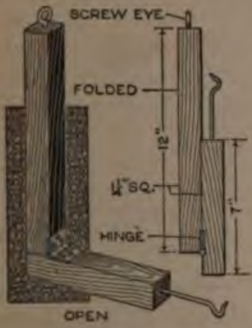
The Electric Tack Hammer Is Invaluable for Many Uses Because It may be Instantly Magnetized or Demagnetized as Desired

Rubber Hose Stops Rattling of Automobile Hood

Many automobile hoods, when they become old, rattle in spite of secure clamping. A good method to remedy this nuisance is to fit the lower edges of the sides of the hood with ordinary rubber gas hose. A section of hose, the length of the hood, is split and slipped over the edge of the side panel. The usual clamps are set into place, and the panel clamped down over the hose. In spite of the jarring, the hose stops the noise.

Suspension Heating Device for Small Utensils

When heating material in any small utensil over a Bunsen flame, or gas plate, one is frequently confronted with the problem of placing the vessel in such a position that maximum absorption of heat will be obtained. This problem was solved by constructing a small folding wooden bracket, which may be hung at the back of the bench from any of a row of nails at various elevations. When not in use the bracket folds, as indicated.



Cleaning Files with Block of Wood

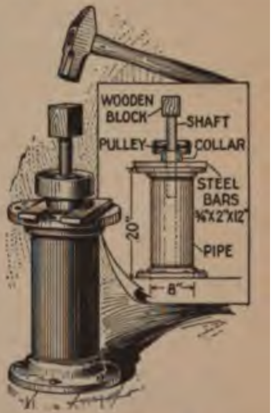
Where a file-cleaning brush is not at hand—and it seldom is at hand when wanted—a quick and effective way to clean files is by rubbing them in the direction of the cut with the end-grain edge of a block of soft wood. The fibers of the wood, at the sharp corner, are pressed into the file cuts and clean out the dirt and particles of metal. The wooden block even removes grease and oil, which a much-used file brush will not ordinarily do.

Wire Soldered over Mouth of Pail Saves Paint

The usual method of removing superfluous paint from the brush is to draw it over the edge of the container. This occasions the loss of paint, inasmuch as some of it always runs down the outside of the bucket. If a piece of wire is stretched across the mouth of the pail and soldered in place, as shown, the brush may be drawn over it to remove all but the suitable amount of paint. The superfluous material falls into the bucket, and the edges and outside of the container are always clean.

Block for Driving Mandrels and Similar Machine Parts

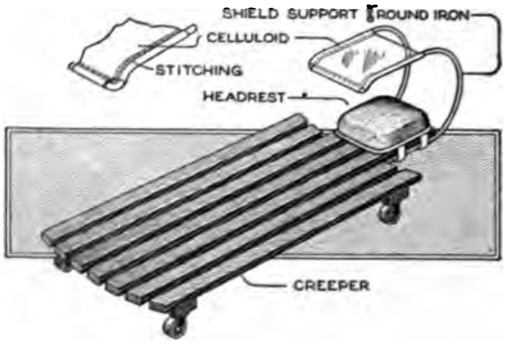
Many shops are unprovided with a block for driving mandrels, or other machine parts requiring a driven fit, and in consequence workmen are embarrassed, and much valuable time is lost on the occasional jobs of this sort that arise. By fitting machined collars on the ends of a piece of heavy iron pipe and bolting its lower end to the floor, a driving block, as illustrated, may be quickly contrived in any shop. Two steel bars, 12 in. long, 2 in. wide, and ¾ in. thick, should be provided for use as rests under small work. A soft hammer, or a block of hard wood, should be used on jobs where there would be danger of swell-



ing the end of the shaft. The diameter of the opening in the end of the driving block should be large enough to insert the hand if parts are dropped inside.

Shield on Creeper Protects Face When Working under Auto

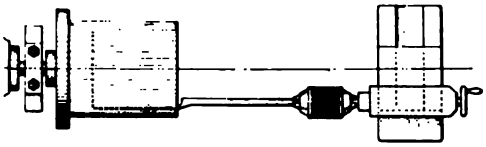
To protect one's face when working beneath a motor car, a transparent shield may be provided above the headrest of a creeper by attaching a sheet of celluloid to an iron frame. The support is made by bending a rod and clamping its free ends to extended slats. The celluloid should be sewed to strips of canvas bound around the rod.



The Frame, Made by Bending an Iron Rod, Supports a Celluloid Shield above the Headrest of the Creeper

Pattern Maker's Boring Tool for Small, Deep Work

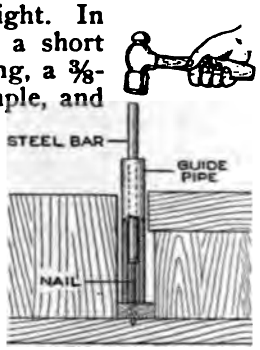
When a pattern maker has small, accurate pieces of work calling for the boring of deep holes of small diameter, it is usually more or less difficult because the necessary tools are not at hand. Most pattern shops are provided with a lathe having a tailstock that may be shifted to the right or left of the lathe bed. By providing a tool as illustrated, and placing it in the drill stock, small, deep, and accurate work may be accomplished. The tool is made from a piece of ⅜-in. tool steel. It is heated and hammered flat, then ground and retempered. When held in the tailstock it will cut a ¼-in. hole, which may be enlarged to any desired size by shifting the position of the tool. Several such tools when made up in different sizes will enable one to meet almost every requirement of deep cutting work.



For Deep, Accurate Work in Pattern Making This Lathe Cutting Tool in Many Instances Fulfills All Requirements

Gas Pipe Guides Nails Driven in Close Quarters

In millwrighting, as in general building-repair work, it is sometimes necessary to drive nails in cramped places where they cannot readily be held with the hand to insure their being driven straight. In such cases, take a short piece of gas piping, a ⅜-in. size, for example, and get a slightly longer length of steel, or iron, rod that will slip loosely into the piping. Then drop the nail into the pipe, sliding the rod behind it, and use the pipe to guide the nail while hammering on the end of the rod, as shown.



Mending Torn Tracings

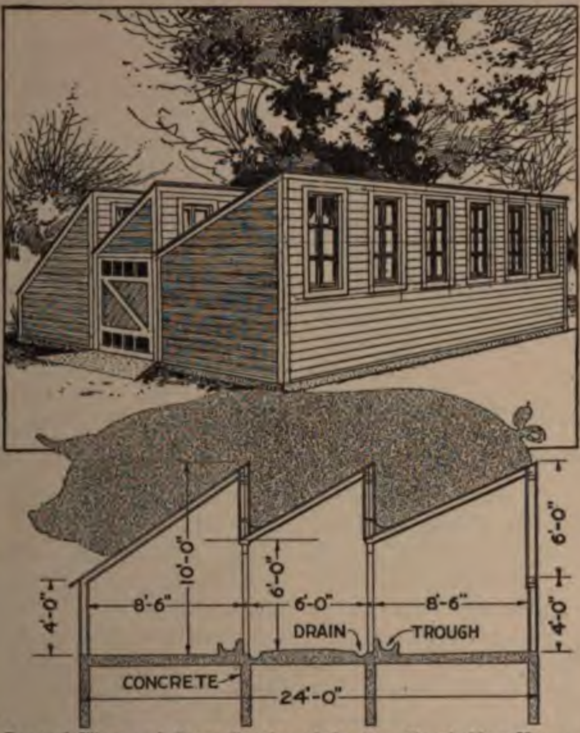
Tracings that have become worn, frayed by use, or torn, may be mended, without destroying their usefulness in making legible prints, by pasting a piece of unused tracing cloth, or tracing paper, at the damaged place. The patch should be pasted on the dull side of the tracing cloth, with library paste. The weave of the tracing-cloth patch should be set to correspond with the weave of the tracing, or serious buckling may result at the patched part of the drawing.

A Sanitary Hog House of Saw-Tooth Design

By HERBERT A. SHEARER

ABUNDANCE of fresh air and sunshine is one of the most important requisites in the care of little pigs and brood sows, and in recent years many excellent types of hog houses have been designed with this consideration in view. Some of these are of very expensive construction, with windows carefully placed and at scientifically correct angles to admit the direct rays of sunlight into the nests during March and April and again in September and October, the usual farrowing months in the latitude of central United States.

One of the most practical of these hog houses is the saw-tooth design illustrated. It is cheaper to build than most of the others, and with its three rows of windows, placed just above the nests, the desired results are obtained most effectively. The rows of windows are so arranged that through the greater portion of the day the house is flooded with sunlight, yet it will be noticed that the structure of the roof is such that the heat stored within during the day is not rapidly radiated at night. This is a desirable feature, since extremes of temperature should be avoided wherever possible.



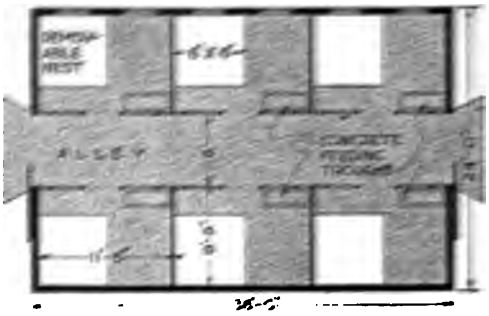
General View and Cross Section of the Saw-Tooth Hog House, Showing Its Exterior Construction and the Provisions for Sanitation That are Made in the Interior: The Dimensions are Given as Details for Building

The perspective illustration shows, in a general way, the exterior construction of the building. In the floor plan it will be noticed that the center alley is made to serve as a feeding room, transfer alley, and place for the drainage gutters. It also forms a passage through the structure from end to end.

The concrete floors in the pens slope slightly from the sides of the house to the alley, to aid cleaning. Overflow from the running water in the troughs is kept out of the nests by reason of the gutters in the alley being lower.

The gutter also has a lengthwise [illegible] feet.

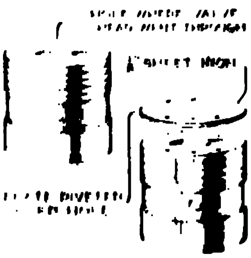
The center [illegible] is supported on 6 by 6-in. posts. These posts also form the alley partitions for the pens. The alleys are 8 ft. wide. This width and [illegible] will be found adequate, as it will permit the use of a [illegible]-wheeled feed cart, and a wheelbarrow may be brought in for purposes of cleaning. Galvanized-iron gutters, as shown in the cross section, carry rain water accumulated between the saw teeth to the ends of the building.



Floor Plan of the Sanitary Hog House, Showing the Arrangement of the Interior, Neat Concrete Feeding Troughs, and Other Features. Gates may be Added to the Pens or in the Alley as Desired

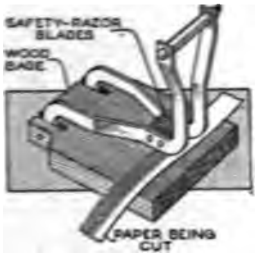
Emergency Repair for a Broken Motorcycle Piston

A broken valve in a motor always results in a broken piston head, if the head of the valve falls inside the cylinder. It was my misfortune to have this experience while many miles from any railroad and several hundred miles from the nearest agency where spare parts could be obtained. In a ranchman's workshop inspection showed that the valve head had gone through the piston edgewise, making a clean-cut hole. After removing the broken parts, I effected the repair shown in the sketch. A sheet iron plate, 1/8 in. thick, was cut exactly the same size as the top of the piston and fastened down with eight copper rivets. To compensate for the increased compression resulting from the plate, a heavy fiber gasket was placed under the cylinder. When assembled, the motor held compression well enough to get started, and after being run for a time with an abundance of oil, it held perfectly. The repair not only got the machine home under its own power, but is still in service after more than a thousand miles of use.—Edwin Edgerton, Alhambra, Calif.



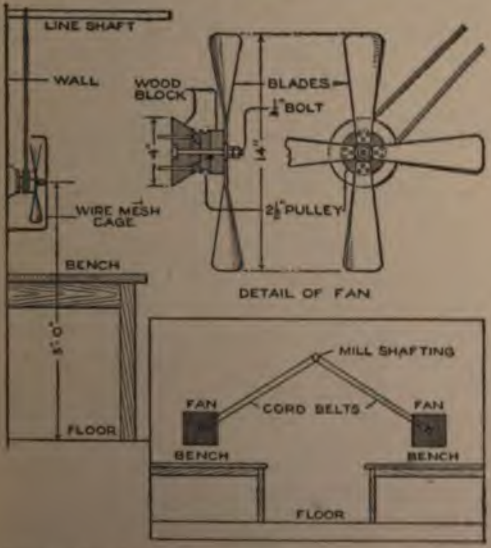
Paper-Ornament Making Machine for Restaurant Use

Restaurant owners who endeavor to please the eye as well as the palate of their customers have long made a practice of adorning the unsightly shank bones of fowls, steaks, and chops with fancy tissue-paper ornaments. But such frills are an expense which counts, especially in these war times. One restaurant owner has built a simple machine and is now making his own paper ornaments during the slack hours that most restaurant people experience between meals. The machine consists of two iron braces, bent and mounted on a wooden base. Between these braces five safety-razor blades of the two-hole type, attached to bolts and with leather spacers between them, are placed as shown. Strips of colored tissue paper to be cut are passed over the board while the handle of the machine is lifted and the blades are pressed down as the paper is moved along. After the edge of the paper has been shredded the strip is cut into the desired lengths, to be rolled and tied for the adornment of dishes according to requirements.—H. Rousset, Washington, D. C.



Fans Belted from Mill Shaft Give Comfort to Workmen

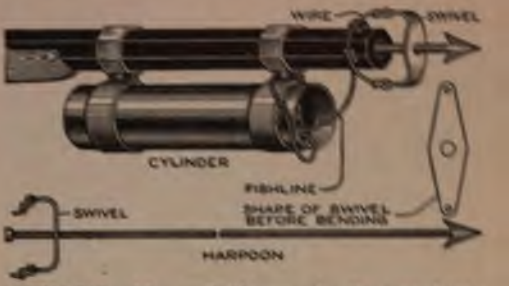
At no expense whatever for power any workman may have comfort through the hot summer months by mounting an old automobile-radiator fan as shown in the sketch, and driving it with a belt from any convenient revolving shaft. The fan is usually obtainable for a trivial sum at any automobile-wrecking house, or if unavailable, it may be made from heavy galvanized iron. The fan hub and its mountings should be of oak, or other hard wood, and the bearing upon which it turns may be simply a ¼-in. bolt. Of course, the more attention that is given to the bearing, the more efficient will be the action of the fan. If an old roller bearing is available, it may be converted into an excellent mounting. A window-sash pulley is riveted to the back of the fan hub to serve as a belt groove. The speed of the fan is governed partly by the speed of the shaft to which it is connected and also by the diameters of the belt grooves of the shaft and fan hub. A cage of wire mesh should in every case be constructed around the fan to safeguard against accidents.



Summer Comfort Is Secured at the Bench and throughout the Shop by Installing an Old Auto-Radiator Fan and Belting It to Any Convenient Line Shaft. The Sketches Show Construction Details

Harpoon Gun for Spearing Fish Made from Old Rifle

A harpoon gun that I have made and used successfully for taking fish may be made from an old large-bore single-shot rifle, as shown in the sketch. A light cylinder, 1½ in. in diameter, is fastened with clips near the end of the barrel to hold a coiled line. The harpoon is then made and fastened with a swivel, as illustrated. The head of the harpoon should be hardened slightly, and is welded to the shaft after the swivel has been put in place. Blank cartridges loaded with a heavy charge of black powder are used to fire the harpoon, which for distances up to 25 ft. has almost the accuracy of a bullet. Before using such a spear for spearing fish, one should determine whether or not the practice is legal in his particular state.—Walter B. Raynor, Patchogue, N. Y.



An Old Rifle of Large Caliber may be Converted into a Deadly and Accurate Harpoon Gun for Spearing Fish

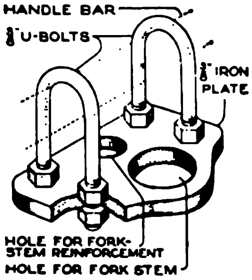
Files Made of Sandpaper Handy in Woodwork

In cabinetmaking, fitting and finishing of parts must be done frequently where sandpaper cannot be applied on the usual sandpaper block. A help for working to advantage in such cases is a set of files made of sandpaper. Strips of the paper are glued to dowel pins of various sizes, to molding, and other shaped pieces, as required for special jobs. A set of standard shapes and sizes can be prepared and kept at hand for frequent use. They will last a long time if given the proper care.

Head-Fitting and Bar-Fastening Repair for Motorcycle

This Improvised Fastening for a Pair of Motorcycle Handlebars was Made in Less Than an Hour. It Proved to Be Stronger Than the Original

While nearing the finish of an otherwise successful record-breaking trial, the handlebars were torn from my machine in a spill. Inspection showed that the expander bolt was broken, and that there was apparently no way to fasten the bars on again without securing new parts. To obtain these from the nearest agency would have occasioned a disastrous delay. I rolled the machine to a blacksmith shop that happened to be near, and there effected the temporary repair illustrated. A steel plate, of the size and shape illustrated, was made and fitted over the fork stem and the end of the fork-reinforcement stem. This plate was locked in place between the head-cup fittings and the fork-stem reinforcement nuts. Two ⅜-in. U-bolts were fitted into the steel plate and tightened up after the handlebars had been passed through them, the handlebar headpost having been previously driven down into the fork stem as far as it would go. The improvised repair was completed in less than an hour. It was stronger than the original construction, and not only saved my record but gave satisfactory service for several thousand miles afterward.—E. G. (Cannonball) Baker, Indianapolis, Ind.

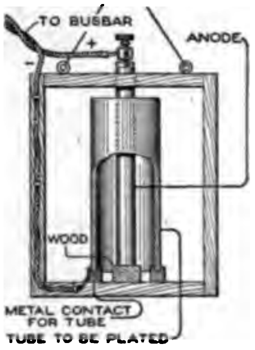


Oiling Motor Timer and Magneto Properly

The timer and magneto of an automobile require little lubrication, but it should be of the best. Pure castor oil is very effective in these places, but should be used sparingly on the magneto bearings. Several drops, two or three times a season, is all that is required.—G. A. Luers, Washington, District of Columbia.

Electroplating the Inside of a Tube or Casting

The usual method of suspending parts in an electroplating bath will not result in a uniform deposit over the inside surfaces of tubes or castings. Successful plating of inside surfaces is not difficult, however, with the use of a special, yet easily constructed, device, as shown in the sketch. A wooden frame is made, with clips, to hold the tube in position, as illustrated. A hole is provided in the top crosspiece of the frame so that the rod of the metal used in plating, zinc for instance, may be passed through and down into the center space of the tube. A flexible copper cord is attached to the rod, and this in turn is connected with the positive busbar when plating. The tube, of course, is connected with the negative bar. This application of the current causes the metal from the central rod to be deposited evenly over the inside of the tube.—K. M. Coggeshall, Webster Groves, Mo.

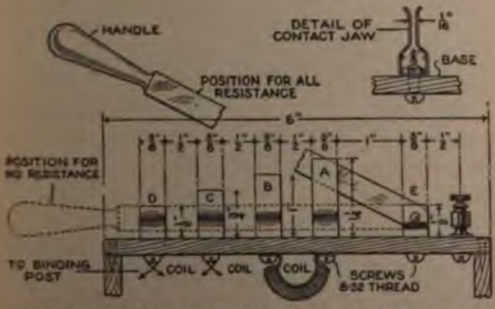


A Motor-Starting and Regulating Switch

The motor-starting, speed-regulating switch illustrated is for use with small electric motors, taking about 10 volts. But by making slight changes, the switch may be used on 110-volt circuits. The blade is of copper, ½ in. wide by $\frac{1}{16}$ in. thick, and 5½ in. long. The contact jaws are also of copper, ⅜ in. wide and $\frac{1}{32}$ in. thick. Four of these will be needed. A strip of the copper is bent to the shape shown, to form the jaws. The lengths of the jaws vary by ¼ in., and are made in the following lengths: 1¼ in., 1 in., ¾ in., and ½ in., one of each length. Mount them upon a piece of hard rubber, fiber, or hard wood, separating them by ½ in. The base of the switch may be the top of the box or containing case which holds the resistance coils. This box should be 6 in. long, 3 in. wide, and 2 in. deep, and lined with sheet asbestos.

On a pencil wind some No. 28 gauge German-silver wire for a distance of 2 in. Make three of these resistance coils. Connect the jaws A and B together with one coil, stretching it down until it touches the bottom of the box, and fasten down with a tack or let it remain loose. Then connect jaws B to C, and C to D. Connect D to a binding post and the blade bearing E to the other binding post.

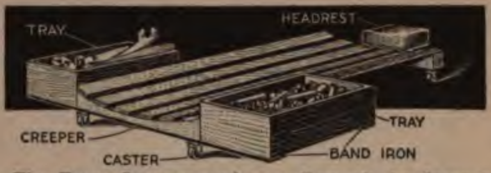
When using the switch, connect in series with the motor. To start the motor, throw the blade into contact with jaw A: all the resistance is on; then push down to B; this cuts out one coil; then to C, and lastly to D, when all the resistance is cut out.—Francis B. Dashiell, Dunkirk, Md.



his Serviceable Motor-Starting and Regulating Switch was Made from Waste Materials Picked Up about the Shop

Creeper for Use under Vehicles is Provided with Tool Trays

Probably the greatest annoyance of working under an automobile, or other vehicle, with a shop creeper is that of laying one's tools on the floor and then moving out of reach of them. This is eliminated, and much valuable time is saved, by providing one's creeper with tool trays, as illustrated. The trays are fastened by means of two horizontal bands of iron bolted under the framework of the creeper. Separate compartments for different tools may be built into the trays, if desired. With this addition, which may be quickly made to any creeper, one is able to work with all his tools at his fingers' ends regardless of how much moving about under the machine may be necessary.—Charles C. Springer, Grand Rapids, Mich.



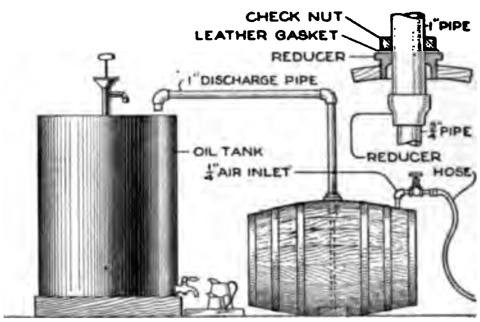
The Trays Incorporated as a Part of the Creeper Enable One to Keep All His Tools within Reach as He Moves About under a Motor Vehicle

Exploiting Old Photographic Negative Glass

Stocks of old plates that have accumulated in photographers' shops during the past years have attained considerable value and are now being purchased for recoating by the manufacturers of photographic supplies. This has been occasioned by a shortage of high-grade glass resulting from the closing by the war of the factories in northern France. These plants were heretofore the sole source of supply of such glass.—Leon A. Haloin, Denver, Colorado.

Oil Discharged by Pressure Eliminates Lifting Barrel

In garages and shops where oil of any kind is used by the barrel, a great deal of back-breaking labor is eliminated by providing a pressure-discharging device, as shown in the sketch. The discharge-pipe reducing bushing is screwed into the bunghole of the barrel to insure an air-tight fit. The air-inlet pipe is also screwed in, as shown. With 50-lb. air pressure in the hose, a 50-gal. barrel is emptied in a few minutes. If the outlet pipe is fitted to within 1/4 in. of the bottom of the barrel the last drop of oil will be forced out.—Samuel C. Carter, Detroit, Mich.



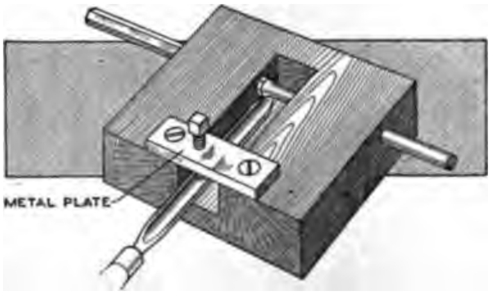
With This Simple Pressure Device a Barrel of Oil is Transferred to a Reservoir with No Other Effort Than Rolling the Barrel

Blasting Soot from Factory Smokestacks

Smokestacks that are clogged with soot are wasteful of fuel. A quick and economical method of cleaning them is by exploding a charge of blasting powder within the stack, thereby creating a concussion which jars loose and brings down all soot deposits on the walls. For this purpose a gun is used. It is made from a piece of pipe shafting, 4 in. in diameter and 16 in. in length. A hole, 1 3/4 in. in diameter, is bored in one end to a depth of 10 in., converting it into a small cannon. A 1/4-in. hole is bored in the side near the base of the longitudinal hole to accommodate a fuse. The cannon is loaded with an 8-in. charge of blasting powder, wadded securely with paper and clay, and is fired after being placed with its muzzle upward in the base of the flue. This charge is usually sufficient to loosen the soot in a chimney 100 ft. high and 4 ft. in diameter. A larger flue, or one that is badly sooted, may require several shots, or the size of the cannon and the charge of explosive used may be increased to meet the requirements. Much time is saved by this method of cleaning. With careful handling there should be no occasion for an accident and no danger whatever of injuring the stack.

A Dowel Cutter for the Home Workshop

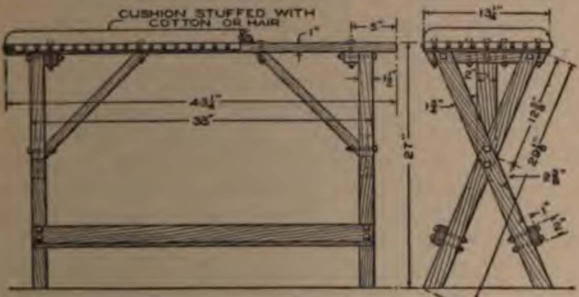
In woodworking, wooden dowels frequently must be of a special size. The homemade cutter illustrated is thoroughly useful, both for making dowels and cutting down those which happen to be oversize. A hardwood block, about 2 by 2 by 3 in., has, near the center of one end, a hole bored the size of the dowel. On the other end a hole is bored large enough to permit the uncut part of the stick to pass through freely. On the middle of one side of the block a slot is cut, as indicated. This slot is large enough to permit a ground gouge to fit into it. The cutting edge of the gouge must center with the dowel to be cut. Over this slot is fastened a metal plate with a wood screw passing through it, to hold the gouge in proper adjustment. A strip of maple, or other hard wood, is sawed to a hexagon slightly larger than the



Dowels may be Quickly Made or Trimmed Down in the Home Workshop with the Aid of This Simple Cutter dowel wanted. One end is then placed in the headstock of the lathe, and while revolving, the cutter is held by hand and started at the other end. By feeding the cutter slowly a smooth, accurate dowel is made.—Arthur A. Richardson, Center Barnstead, N. H.

Convenient Bench for Use at Drafting Table

Many draftsmen find the ordinary high stool uncomfortable and inconvenient, especially when working on a long sheet. After considerable experimenting in a large drafting room, benches of the type shown in the illustration were found to overcome both objections to the high stool. It is strongly constructed, as shown, the joints being bolted wherever possible.

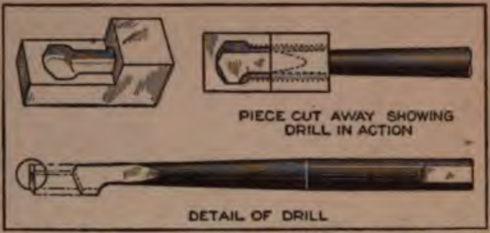


This Strongly Made Draftsman's Bench was Found More Convenient Than the High Stools Commonly Used

The padded cushion, of strong, smooth cloth, is an especially good feature, and the foot rests also provide stout braces. Oak and maple are good woods from which to make the bench, and can be finished easily to match other furniture.

Drill for Enlarging the Bottom of Threaded Holes

The drill illustrated is ground from a piece of tool steel to the shape and size required for the work in hand. After this type of drill has been used, bottoming taps will be found unnecessary. It also permits enlarging the bottom of the hole without the slightest danger to the threaded walls. In a hole thus bottomed, the stud may be screwed in firmly, as there is vacant space all around its end, and once sent home it will have little tendency to back out.—M. L. Lowrey, Livermore, Calif.



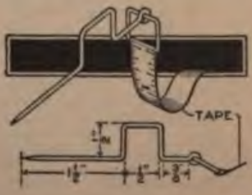
Threaded Holes are Easily and Efficiently Enlarged at the Bottom by the Use of This Simple Tool

Paraffin for Woodworking Tools

Paraffin is a desirable lubricant for tools used on woodwork, because it is clean, leaves no stains or marks on the wood, and stays on the tools longer than oil or grease. It is easier to apply, being simply rubbed on, can be carried unwrapped and unprotected in the pocket, and is more economical than oil. One-third of the tablet commonly sold fits the hand and the pocket. For rabbet and plow work, paraffin is especially handy. It sticks to the wooden surfaces of tools used in such work, and if a little is rubbed occasionally along the sides of the rabbet or plow, the plane works easier.

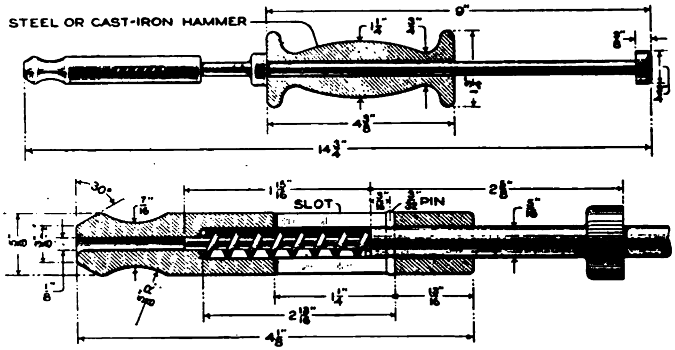
Quick-Releasing Tapeline Holder does Not Snag Readily

By bending a piece of No. 10 gauge wire to the form shown, a helpful hook-and-pin tapeline anchor is provided for single-handed work. It may be made fast almost anywhere and released by simply whipping the line. When the tape is reeled in, the hook does not snag in weeds or grass.

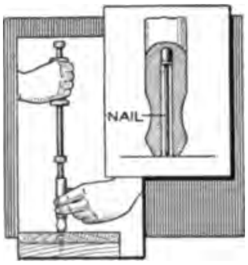


Handy Tool Drives Small Nails into Hard Wood

Driving small nails in hard wood is difficult because, if the utmost care is not used, they will bend rather than enter the wood. The homemade tool illustrated overcomes this difficulty by holding the nail so that it cannot bend while driving it home or into the wood at an angle. There are but four principal parts to the tool, and these are of the shapes and dimensions indicated in the sketch. All are made of shaft steel, with the exception of the sliding hammer, which may be of cast iron. The end of the driving rod is hardened and magnetized for picking up the nails. The upper end of the rod is threaded, and the cap is screwed on and pinned in place after the hammer has been mounted. The nail tube is hollowed out, as shown, and provided with a coil spring to accomplish the rebounding of the driving rod after each blow is struck. The nails are placed, one at a time, in the nail tube, which is then set over the spot where the nail is to be driven. A few blows with the hammer finishes the task. Even the most slender nails may be driven into the hardest wood without danger of bending.



Small Finishing Nails are Quickly Driven into Hard Wood without Danger of Bending, with the Aid of This Simple Homemade Tool



Easy Method of Removing Foreign Particles from the Eye

The removal of foreign substances from the eye is difficult when the hands are smeared with grease or other stains of shop work. Under such circumstances the desired result is frequently accomplished by immersing the eye in a basin of clean, warm water and then blinking rapidly half a dozen times. Unless the particle has actually been imbedded in the eyeball or lids this procedure will usually wash it out or into the corner of the eye, where its removal becomes easy.—T. J. Grogan, Atlanta, Georgia.

Round Recesses Easily Cut with Homemade Tool

The legs of furniture fitted with casters are less liable to split if the caster stems are fitted into short lengths of gas pipe of the proper diameter and recessed into the wood. To make the pipes fit, recesses should be cut in the ends of the legs with a cutter made from a piece of the same pipe. The tool should be 6 in. in length and provided with a row of teeth on one end. After sharpening the teeth, which may be done with a file, that end should be tempered slightly. A hole is then drilled through the other end for the insertion of a rod to serve as a cross handle. Quick and thoroughly accurate work is accomplished with this tool, and the holes thus made are the correct size to take the pipe, insuring a perfect driven fit.—Frank L. Matter, Portland, Ore.

Simple Test to Distinguish Wood Alcohol from Denatured Alcohol

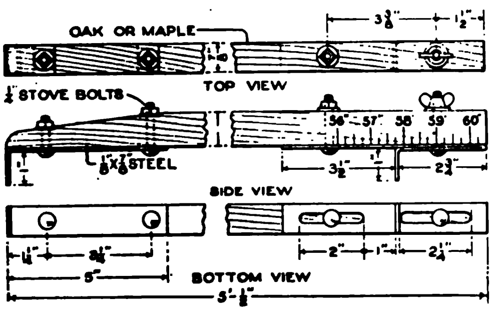
It is often difficult to tell the difference between refined poisonous wood alcohol and denatured alcohol. A thin piece of celluloid, if put in a vial of the alcohol in question, will quickly reveal its nature. Wood alcohol will dissolve the celluloid, while denatured alcohol will have no other effect in 12 hours than to remove the polish. In handling these chemicals it should be borne in mind that wood alcohol is not only a deadly poison if taken internally, but that one may be poisoned by breathing its fumes, or by absorption through the skin.

Old Files Made Serviceable by Treating with Acid

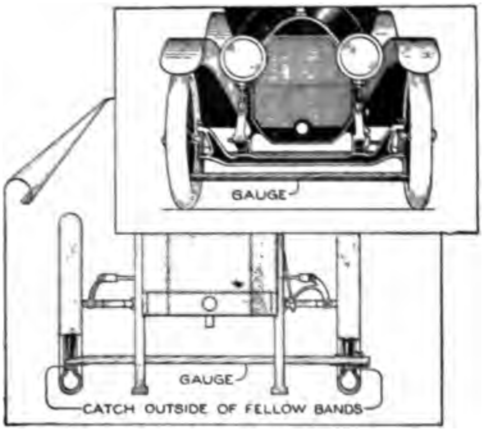
Files that have been worn until they are no longer fit for use may be made to render additional service by soaking them for 48 hours in a weak solution of sulphuric acid. The worn teeth are corroded so that numerous sharp cutting edges remain. When using sulphuric acid it should be remembered that it is poisonous and corrosive, and should be handled with great care.

Gauge Stick Useful for Alining Automobile Wheels

In alining automobile wheels, either in assembling or in making repairs, a gauge stick, as illustrated, is of material aid in procuring the accuracy essential to obtain maximum tire mileage. Guesswork wheel alinements are usually costly experiments. The stick is best constructed from a piece of maple or other good, clear wood. It should be 5½ ft. long, 1 in. wide, and ⅞ in. in thickness. The end fitments are made from ⅛-in. band-iron stock.



Construction Details of the Automobile Wheel Alining Gauge Stick

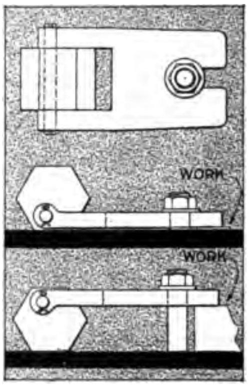

GAUGE
GAUGE
CATCH OUTSIDE OF FELLOW BANDS

In Use, One End of the Gauge Stick is Hooked over One of the Rims While the Measurements are Taken on the Opposite Wheel

Method of Planing Chair Cane

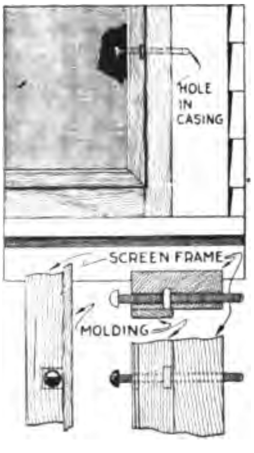
When recaning a worn-out chair seat it often happens that one wishes to reduce the size of one or more of the strands of cane. This may be satisfactorily accomplished by guiding the cane against a plane bit with a large darning needle. The plane is placed, bottom side up, in a vise. The eye of the needle is then thrust upward through the throat of the plane and the cane threaded into it. By pulling the cane through the eye and across the cutting edge with one hand and pressing it squarely against the plane bottom by means of the needle with the other hand, a fine uniform shaving may be removed. Besides reducing the size, this treatment eliminates rough edges and splinters and corrects variations in width. Smoother, neater work is thus obtained.—T. A. Reynolds, Monroe, Wis.

An Adjustable Clamping Device for the Machine Shop



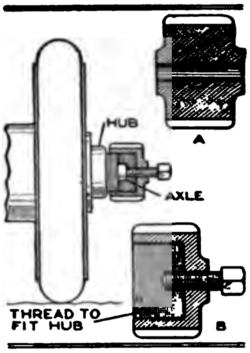
The clamp illustrated is an economical one that may be constructed by any mechanic. It is especially convenient for securing work on a planer, shaper, on the faceplate of a boring machine, or a lathe. The pin is so located in the blocking as to give a different distance to each face. As the height is also changed by turning the whole thing over, as shown in the sketch, twelve different heights may be secured.—G. M. M., Woonsocket, R. I.

Fastening Fly Screens in Sashes with Stove Bolts



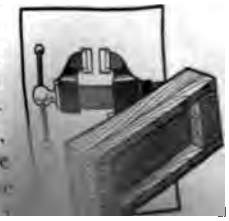
A substantial yet readily removable fastening for fly screens in window sashes is made by setting stove bolts in the screen frames, as shown in the sketch. A square hole of the size and shape of the nut used with the stove bolts is chiseled into the side of the screen frame. The hole is then drilled in the center of the square depression for the passage of the bolt. A similar hole is made for the bolt in the window casing. A touch of white lead, or putty, may be applied to the nut socket in the screen frame to hold the nut securely after it is pressed in. The screen is then set in place and the bolt turned h with a screwdriver. Two bolt applied in the middle of the two of the screen frame are usually cient to hold it against the rigo the most severe summer storms.

Device for Removing Automob Wheels from Axle



The illustration shows how I an excellent wheel puller from a reverse which I fou the junk pi my garage. drawing, at shows the s of the gea section. I b out and thre the inside, shown at making thread of same size as on the wheel hubs. I then tapped hole in the gear and provided a str hexagonal machine bolt. To remov wheel, turn the puller onto the h give the machine bolt a few turns w the aid of a large wrench, and t wheel is removed readily.—K. L. M ler, Boston, Mass.

Wooden Caps Convert Machinist's Vise into Bench Clamp



In most carpenter shops a machinist's vise is provided, and it is often desirable to use this for finishing small pieces that are difficult to hold in an ordinary bench vise. By providing the machinist's vise with

ca

t

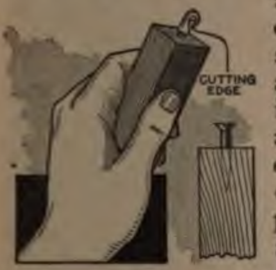
do. The finished caps should be lined with leather to prevent splitting of the wood, and to provide the slight resiliency necessary.

Acid-Proof Cement for Pipe Fittings

An excellent cement for packing the joints of piping or vessels containing strong acid solutions is made by mixing equal parts of asbestos fiber, linseed oil, and white lead. For weak acids the cement may be cheapened by the addition of clay.—J. J. O'Brien, Buffalo, N. Y.

Handy Twine Cutter Made from a Wood Screw

By heating and flattening the head of a large wood screw, driving it into a block of wood of a convenient size to serve as a handle, and filing the head as illustrated, an excellent twine-cutting tool is produced. Such a device may be contrived in about five minutes, and for use about a shipping room or other place where twine is used it is invaluable. Any twine, from ordinary wrapping cord to a carpenter's chalk line, is instantly severed by jerking it against the cutting edge.—George W. Smith, Chicago, Illinois.

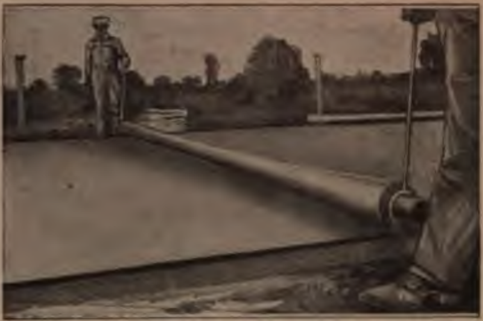


Emergency Corrugated Fasteners for Use in Woodwork

Splendid corrugated fasteners for locking boards together may be made by running strips of heavy-gauge tin, copper, or other sheet metal, through a pair of meshed gears and cutting the wrinkled strips into the desired lengths. Upon the size of the gears will depend the size of the fasteners. This operation will in no way injure the gears.—H. W. Offins, Grants Pass, Ore.

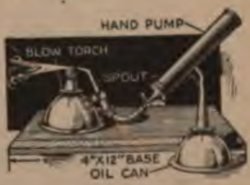
Wooden Roller Aids Construction of Concrete Highways

A concrete-road roller of the type illustrated is easily made and is of inestimable value because it gives the desired drainage pitch to the center of the highway with a single rolling operation. The roller shown was used in the construction of a cantonment highway, 18 ft. wide. It was turned from a piece of yellow pine, 8 in. square and 20 ft. in length. A dowel, 1 ft. long, was turned on each end, and over each an iron handle was fitted, for convenience in handling the roller while molding the highway.—Frank Yocum, Reading, Pa.


The Roller Tapers to a Smaller Diameter near the Middle, and Thus Automatically Rolls a Concrete Road to the Correct Pitch for Drainage

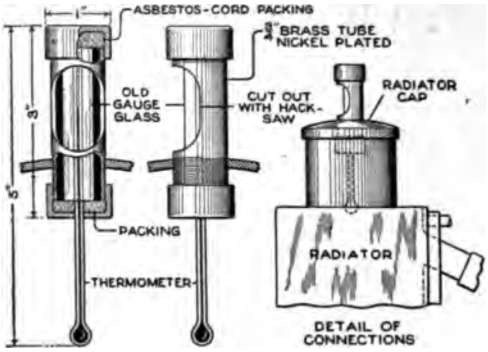
Blowtorch Made of an Oilcan and a Bicycle Pump

A handy blowtorch for light soldering and heating may be made by combining parts of an oilcan and a bicycle pump, as indicated in the sketch. The spout of the oilcan is cut off and soldered to the body to form an air nozzle directed just above a wick inserted in the neck. A piece of air hose is used to connect the pump with the air spout, after which the whole is mounted on a 4 by 12-in. wooden base, by means of screws passing through an extension soldered to the bottom of the oilcan.



Thermometer for Water-Cooling System of Motor Car

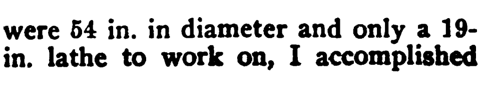
In making a temperature gauge for a motor-car radiator, a short piece of ¾-in. nickelplated brass pipe may be used. The threads at the bottom are extended for about ¾ in. and above them a suitable opening is cut with a hacksaw. The top is stuffed with packing, capped, and the pipe screwed through a hole bored in the center of the radiator cap. The instrument is completed by fitting a gauge glass inside the tube, inserting a thermometer, placing the necessary packing, and tightening the lower cap, drilled in the middle of which is an aperture of slightly greater diameter than the thermometer.—P. P. Avery, Garfield, N. J.



Warning of an Overheated Motor is Given by This Easily Made Temperature Gauge Screwed in the Cap of an Automobile Radiator

Turning a Fifty-Four-Inch Wheel on a Nineteen-Inch Lathe

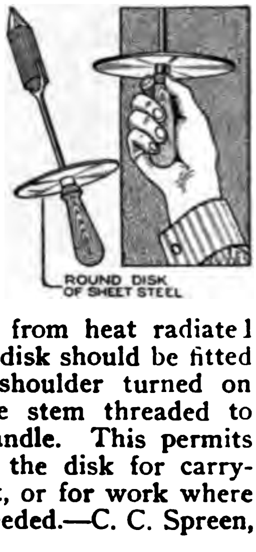
Having some machining to do on the hubs of several vehicle wheels that were 54 in. in diameter and only a 19-in. lathe to work on, I accomplished the task as shown in the sketch. A piece of 2-in. shafting, 10 ft. long and tapered at the end to fit into the hub, was fastened in the lathe by the use of a steady rest, as indicated. A nut held the wheel on the end of the shaft, and the tool rest was moved to the extreme end of the bed, where the hub was machined with no difficulty greater than an occasional application of oil to the bearing of the steady rest. —John S. Williams, Aurora, Ind.



With the Aid of an Improvised Steady Rest, a 54-Inch Wheel was Machined in an Ordinary Shop Lathe

Soldering-Iron Shield Protects Hand from Dripping Solder

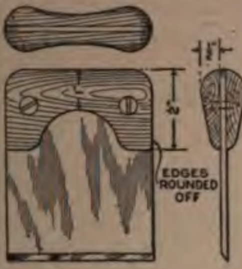
For overhead soldering operations a heavy leather glove does not always prevent being burned by the drops of solder that may fall from an overheated or improperly tinned copper. A metal-disk shield, fitted on the stem of the tool as illustrated, offers complete protection against dripping solder as well as from heat radiated by the iron. The disk should be fitted against a small shoulder turned on the stem and the stem threaded to screw into the handle. This permits quick removal of the disk for carrying in the tool kit, or for work where it would not be needed.—C. C. Spreen, Flint, Mich.


ROUND DISK OF SHEET STEEL

Easy Method of Connecting Sections of Pipe

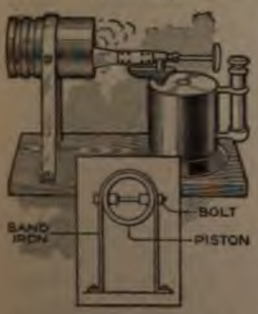
Connecting two courses of pipe, or stack, having lapped joints, is often a difficult task. By blocking up the courses of the joint, leaving the outer edge of the section resting on the floor, bolting the sections at the bottom of the joint, and then removing the blocking, the work is simplified. The weight of the pipe will force the upper parts toward each other if the inner sections are tapped lightly with a soft hammer. Drift pins are also used to aid in pulling the courses together.—W. H. Thomas, Davenport, Ia.

A Convenient Homemade Scraper Handle



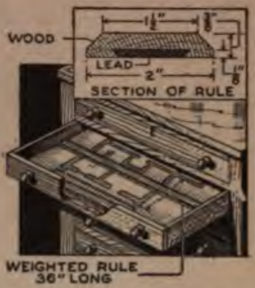
Scraping is always hard work when carried on in the usual fashion of grasping the bare, sharp-cornered blade. There are numerous commercial scraper handles, but most of them have the objection of hampering nicety of control. The scraper handle illustrated, while giving a comfortable handhold, also reduces the effort of scraping. It is made from two pieces of ½-in. hard wood, preferably apple or rosewood. The outline is first cut with a coping saw. Then the curves are worked with a rasp and file. Holes are drilled through the blade to accommodate the two screws, which are countersunk and hold the halves of the handle.

Worn-Out Piston Used as Blowtorch Furnace



When small parts must be heated for tempering, some sort of a heat-retaining furnace is essential if the heat is to be properly distributed and the temper uniformly applied. A simple furnace for such use is made by mounting an old cast-iron piston, as shown in the sketch, and using a blowtorch to direct the heat into the open end. With this arrangement thoroughly efficient heating and tempering is easily accomplished.

Weighted Rulers Keep Drawings from Rolling When in Use



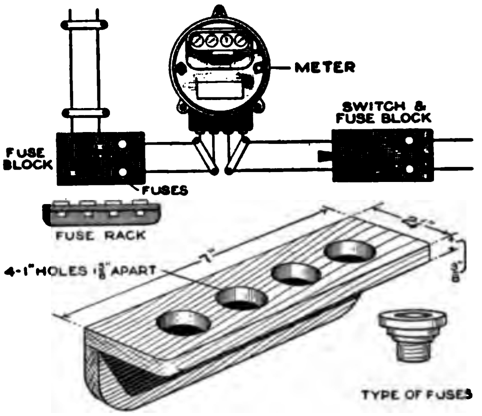
To a large extent the trouble encountered by draftsmen in keeping drawings, that have once been rolled, from curling when spread on tables, may be overcome by using weighted rulers. Made of hard wood in the manner illustrated, and covered on the bottom with dark felt, they serve satisfactorily. If the rulers are placed on drawings in filing cabinets, they enable crowded drawers to be opened without disturbing the contents.

Stethoscope for Telephone and Automobile Use

Difficulty of hearing over a telephone may be eliminated and loose bearings in internal-combustion motors are quickly located by the use of a physician's stethoscope. Many such instruments of slightly antiquated models are obtainable for a nominal sum, and for mechanical service are quite as good as new ones. For the telephone, the diaphragm is fitted to the receiver. This enables one to hear perfectly, regardless of noises in the immediate vicinity. In locating mechanical irregularities about machinery, the diaphragm is placed against the machine and by listening through the ear tubes the position of the trouble is quickly determined.—F. Ball Pinkus, La Crescenta, Calif.

Rack near Fuse Block Holds Fuses for Emergency

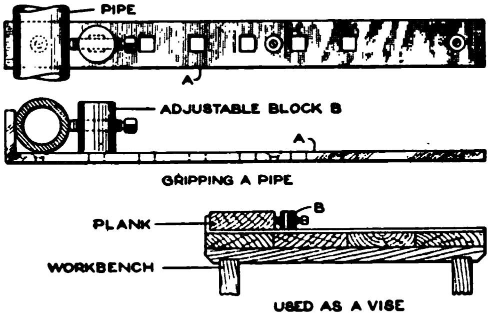
When an entire plant is plunged in darkness by the burning out of a fuse, it is decidedly inconvenient and even dangerous for one to go fumbling about to find a spare fuse. This is an annoyance that is eliminated for all time by the installation of a fuse holder, as shown in the sketch. With the spare fuses so located, a burned-out one may be replaced by the light of a single match.



The Spare-Fuse Rack may be Contrived with a Few Minutes' Work, and Much Inconvenience and Vexing Delays will be Avoided

Handy Vise or Wrench Tool for Bench Use

A tool that will be found useful for many purposes about the small shop is the simple vise combination illustrated. The body of the tool consists of a flat bar of steel, A, which is bent up at a right angle at one end. In this bar a number of holes are drilled, 1 in. apart. The holes are then squared, and into them a block, B, with a setscrew, as shown, is fitted. In use the piece of pipe, shafting, or other material to be worked upon is placed against the angular end of the bar. The lug is then set in whatever hole is most convenient, and the setscrew is tightened down on the object.—Samuel H. Frankenberg, Pawtucket, R. I.



For Gripping Round Objects of Either Wood or Metal and Holding Them Securely on the Workbench, This Simple and Readily Adjustable Tool Is Useful

Prolonging the Life of Hammer Handles

The life of a hammer handle may be prolonged if the wedges and head are removed and the end soaked in linseed oil. The end should be placed in the oil and allowed to remain for three or four days. It should then be removed, wiped off, and allowed to dry for a week before the head and wedges are replaced. The resulting toughness and "life" imparted to the handle will be surprising.—Henry Simon, Laguna Beach, Calif.

Cutting Disks or Rings Accurately from Sheet Metal

It is difficult to hold a piece of sheet metal to the faceplate of a lathe without boring holes in it. This is a difficulty that may be readily overcome by proceeding as follows: Warm the piece of sheet metal slightly and place upon it a piece of paraffin, sufficient to spread out and cover the surface when melted. Remove the faceplate and set it, face down, upon the paraffined surface of the metal. When the metal becomes cold the paraffin will have hardened and will be held against the faceplate firmly enough to permit very accurate cutting of disks or rings if care is used.—J. Garrett Kemp, Stillwater, Okla.

¶Handles on machinery are usually set so that a clockwise movement actuates the part controlled forward, and the reverse, backward.

War-Time Efficiency Methods Applied to the Dairy Barn

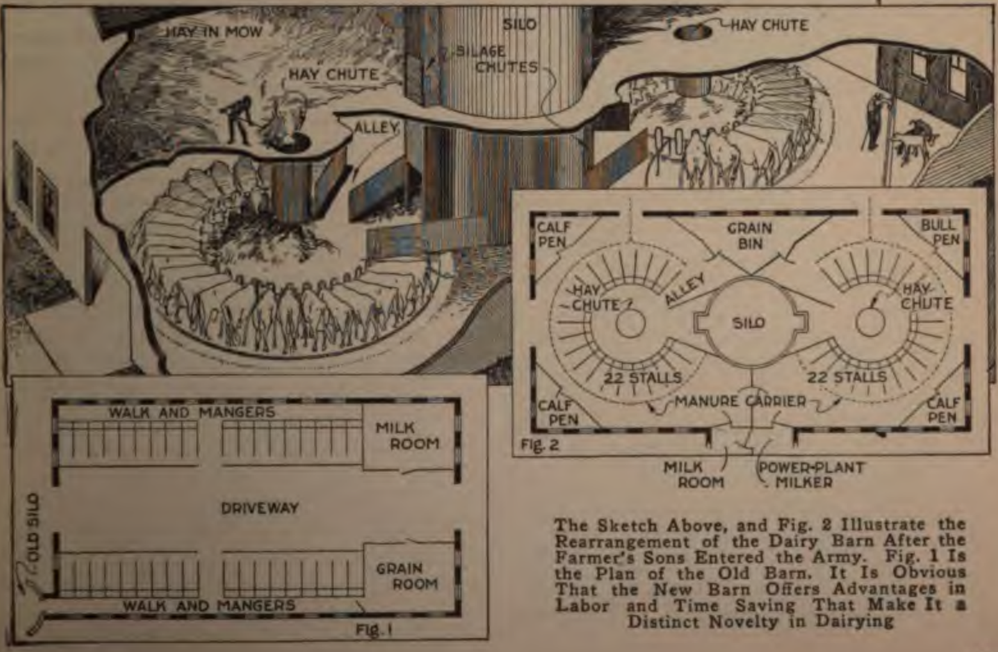
By H. V. STANLEY

A FARMER who conducted a dairy farm found himself seriously handicapped when his two sons enlisted in the army and he was left to attend alone a herd of 32 milch cows which formerly required the services of the three. At first it appeared as if he must dispose of at least part of the herd, as competent farm help was unobtainable. To have sold the stock would have meant the sacrificing of an estate that had taken years of toil to build up.

The problem was solved by rearranging the barn, as illustrated in the sketch, and laying it out on the plan shown in Fig. 2. With the remodeled barn the herd was not only retained but increased by eight head, while the farmer unassisted now accomplishes in less time the work which formerly demanded the entire attention of himself and his two sons.

Figure 1 illustrates the plan of the barn before the young men entered the army. In this form, the stable housed 32 milch cows. A bull and the calves were kept in separate pens and shelters adjoining. The cows were then milked by hand. Grain, hay, and ensilage were hauled about with pushcarts, while wheelbarrows were used for cleaning the place. The bull and calves also demanded separate attention. The amount of work entailed by this plan occupied the entire time of the three men.

In the remodeling, the entire interior

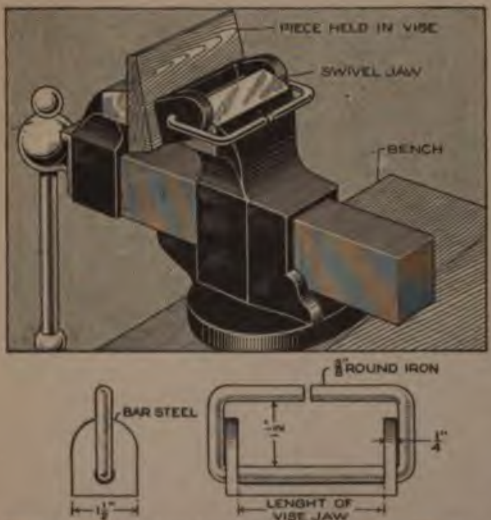


The Sketch Above, and Fig. 2 Illustrate the Rearrangement of the Dairy Barn After the Farmer's Sons Entered the Army. Fig. 1 Is the Plan of the Old Barn. It Is Obvious That the New Barn Offers Advantages in Labor and Time Saving That Make It a Distinct Novelty in Dairying structure of the old barn was removed. The old insanitary wooden floor was replaced with cement. The old silo was torn down and replaced with a new one of concrete, in the position indicated in Fig. 2. The old rows of stalls and stanchions were rearranged as shown, with provision for 22 milch cows in each circle.

A power-plant milker, operated by one man, now does in 30 minutes the work that formerly took three men two hours. Feeding is also accomplished with a similar saving of time and labor by the new arrangement. Hay is thrown down from the mow, and from the chutes drops into the center of the stall circles, from which position it is pitched to the stock with little effort. When hay is thrown from the mow, ensilage is also thrown down and is accessible for feeding. The ensilage chutes extend through the roof and serve as ventilators for the stable. Mucking out is accomplished in less than an hour by the use of a wheeled carrier behind the rings of stalls, as indicated in Fig. 2. A small truck is used to carry grain from the bin and place it before the cows. The bull and calves, of course, are attended separately, but nevertheless at a great saving of time and energy over the old arrangement of the barn.

Swivel Jaw for Holding Wedge-Shaped Articles in Vise

Wedge-shaped or beveled-edge articles are usually difficult to clamp in a vise for the reason that one side of the vise jaws will not rest squarely upon the surface. Absolute security may be had in the clamping of such articles with the aid of a swivel-jaw attachment, as illustrated. The jaw is cut to the shape indicated from a piece of bar steel and is hooked over the permanent vise jaw with a $\frac{3}{8}$-in. iron link, as shown. The dimensions of the swivel jaw are of course determined by the size of vise in connection with which it is to be used. It may be knurled on the clamping surface or left smooth as requirements demand.—C. C. Spreen, Flint, Mich.



With the Swivel-Jaw Attachment for a Vise a Wedge-Shaped Article may be Clamped as Securely in an Ordinary Vise as If the Surfaces Were Parallel

Auto Air Intake Guarded for Crossing Streams

Having frequent occasion to cross a small stream that was just deep enough to kill my automobile engine, I devised a scheme to obviate this nuisance. I disconnected the air intake at the carburetor, and placed one end of a piece of rubber hose, about 3 ft. long, over the nipple on the carburetor, fitting the joint air-tight, and bent the hose upward into the engine hood. The hose permits the air for the carburetor to be taken in above the water level, and the water therefore cannot drown it. The electrical timer is coated with grease and oil, and requires no protection for the minute or two consumed in fording.—P. R. Miller, Indianapolis, Ind.

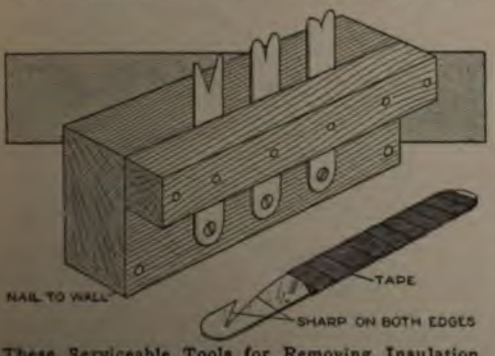
¶Old dry cells may be stimulated for temporary use by removing the wax at the top and moistening the interior with a solution of common salt and vinegar.

Cutting Small Copper Tubes with Side-Cutting Pliers

When small copper tubing is cut with pliers the result usually is that the end of the tube is pinched shut. By securing a few lengths of soft annealed-iron or copper wire of the same size as the inner diameter of the tubing, inserting them in the tube, and cutting both off together, satisfactory results may be accomplished. The wire serves to hold the tube intact so that it is cut without distortion of the end. After cutting, the stub of wire may be shaken out the other end of the tube or dislodged from it by inserting a piece of smaller wire.—Rutherford B. Williamson, Binghamton, N. Y.

Handy Electrician's Tools Made from Old Hacksaw Blades

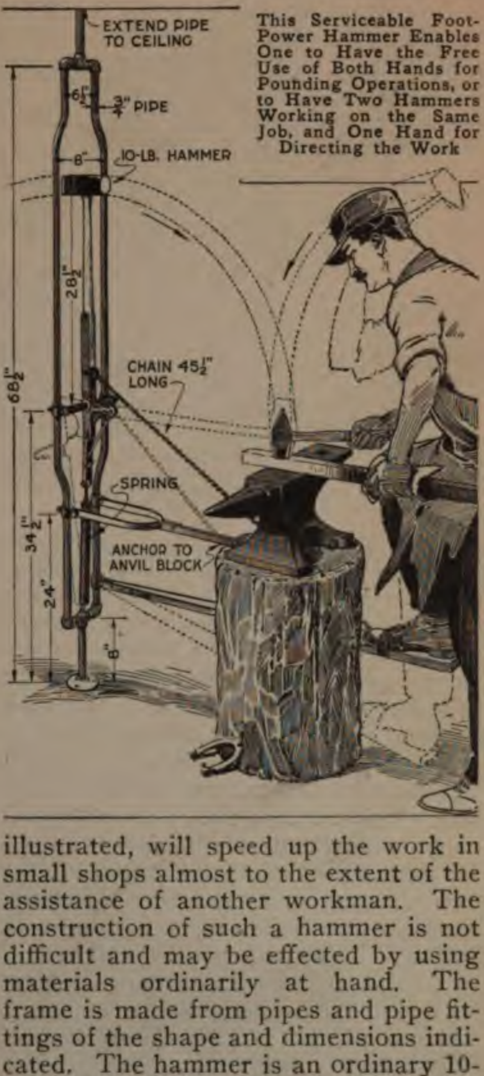
A number of tools having a wide range of utility about the electrician's bench may be made by notching old hacksaw blades, as illustrated. If provided with different shapes and sizes of notches, several such blades, mounted on a block as indicated, will give one the means of almost instantly removing the insulation from a piece of magnet wire or heavy transmission feed wire. If taped, or otherwise provided with handles, such saw-blade knives become handy tools for carrying in the pocket or for tool bag use.—C. A. Houseman, Cleburne, Texas.



These Serviceable Tools for Removing Insulation are Made by Grinding Old Hacksaw Blades

A Foot-Power Hammer for Use in Small Shops

For welding and similar hammering operations a foot-power hammer, as illustrated, will speed up the work in small shops almost to the extent of the assistance of another workman. The construction of such a hammer is not difficult and may be effected by using materials ordinarily at hand. The frame is made from pipes and pipe fittings of the shape and dimensions indicated. The hammer is an ordinary 10-lb. sledge, mounted on a pivot casting as shown. A pattern for this was made and the casting done by a local foundry. All the other parts were made in the home shop.—J. N. Muncey, Jesup, Ia.



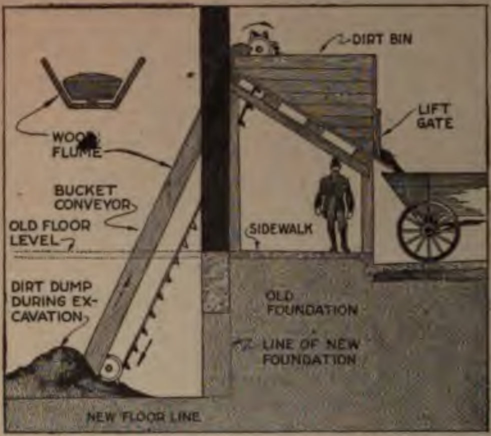
This Serviceable Foot-Power Hammer Enables One to Have the Free Use of Both Hands for Pounding Operations, or to Have Two Hammers Working on the Same Job, and One Hand for Directing the Work

---

¶Holes in concrete are ordinarily caused by air bubbles. These may be eliminated by stirring after the concrete has been poured in the forms.

Labor-Saving Method of Excavating under a Building

By the use of a conveyor-belt and dump-bin system, as illustrated, a basement has been dug under a large reinforced-concrete building with a minimum of labor and without obstructing the sidewalk. An opening was made in the front wall of the building and a hole dug to the depth of the basement and large enough to install the conveyor. The conveyor was operated by a small motor and dumped the dirt taken from the excavation into a bin built high enough above the sidewalk to provide headroom underneath. A lift gate was built in the end of the bin and served to regulate the loading of the wagons.



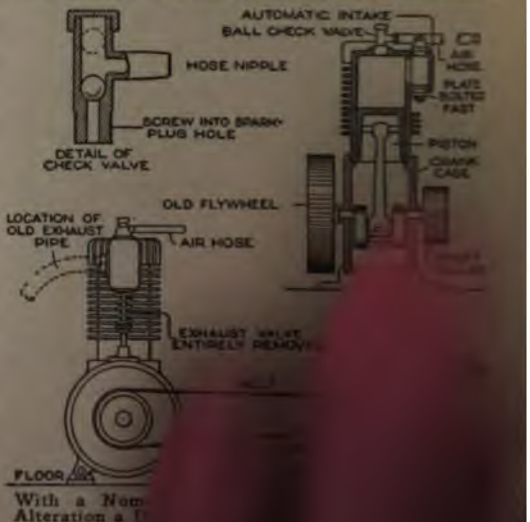
Without Disturbing the Occupants of the Building or Obstructing Street Traffic, a Basement was Dug under an Apartment House by the Use of an Endless Conveyor Belt and an Overhead Bin

Drawers under Bench Vise to Catch Filings

When working on costly metals a convenient method of preserving the filings is to have a tier of shallow drawers directly beneath the vise in which the work is being done. If it is lead upon which one is working, the top drawer is pulled out. The other drawers are used for copper, brass, aluminum, or bronze, as the case may be. Each drawer should be labeled and used exclusively for one kind of metal. It is then easy to collect and redeem the filings when a drawer becomes filled.

Garage Air Compressor Made from Discarded Cycle Motor

By making a few simple alterations on an old motorcycle engine that had outlived its usefulness as such, a garage man has provided his place with an excellent and economical air compressor. The motor was first rebored and a new piston fitted, to insure good compression. A steel plate, with a gasket under it, was bolted over the exhaust port, to close it. The original automatic inlet valve was left intact, to supply air to the cylinder when being used as a pump. A ball-valve hose connection was substituted for the priming cock on top of the cylinder, and the hose from it connected with the air tank. A longer main shaft was fitted to the engine, and on its end an ordinary shaft pulley was keyed and mounted, as illustrated. The old motorcycle flywheel, originally outside the crank case, was left in place to supply the necessary momentum. Steel lugs were made and bolted to the floor, and into these the motor base was fastened



With a Nom
Alteration a
Converted in

in the sam
rally be h

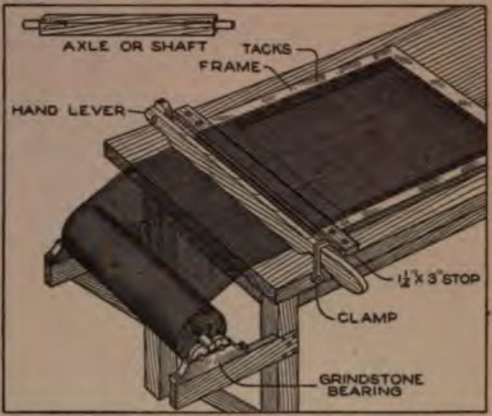
The completed compressor was belted to a 1-hp., 110-volt motor. Lubrication was provided by splash system, the oil being placed in the motor base. The completed outfit cost but a fraction of a new commercial article, but proved thoroughly satisfactory in its operation.—P. P. Avery, Garfield, N. J.

Efficient Method of Cleaning Small Pinion Gears

Small gears such as those of watches, clocks, and other light machinery, are quickly and thoroughly cleaned by being stamped into the pithy center of a piece of elderberry or burdock. All grease and residue are instantly wiped from between the teeth. The wheel is then shaken out, and the piece of wood prepared for the next one by being cut off beyond the used portion.

Device for Stretching Fly Screen over the Frames

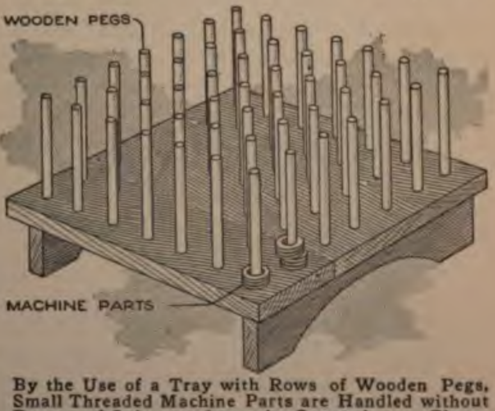
By the use of the screen-stretching device illustrated, work is speeded up as well as accomplished with greater efficiency. Two wooden brackets are secured on the left-hand end of the workbench. These should be slightly lower than the top and provided with rollers, as indicated. An axle or shaft is then provided, and on this the screen is rolled. About 12 in. from the end of the bench, a stop is screwed to hold the screen frame while working upon it. A wooden hand lever is then pivoted to the farther side of the bench, and at the other end is provided with a metal clamp for locking it in position. The screen is unrolled from the stock, tacked to one end of the frame, and then stretched by pressing down the hand lever. The lever is clamped in position, and holds the screen taut while the tacks are being applied to the frame.—Herman F. Zimmerman, Los Angeles, Calif.



Tacking Screens to Their Frames is Simplified and Better Work is Accomplished with the Aid of This Bench Device for Stretching the Wire

Tray for Moving Small Threaded Parts without Injury

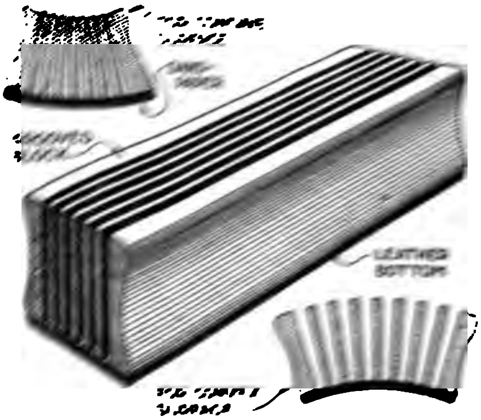
To truck small machine parts which are threaded both inside and out, without danger of damaging them, a carrying tray as illustrated is invaluable. The parts are slipped over soft wooden pegs which are so spaced over the surface of the tray as to prevent the parts from coming in contact with each other. Pegs should be of suitable length to hold 10 parts on each. This is a great aid in counting.



By the Use of a Tray with Rows of Wooden Pegs, Small Threaded Machine Parts are Handled without Danger of Injury and may be Counted at a Glance

Sandpaper Block for Use on Curved Surfaces

A [illegible] sandpaper block for use on [illegible] is made by attach-

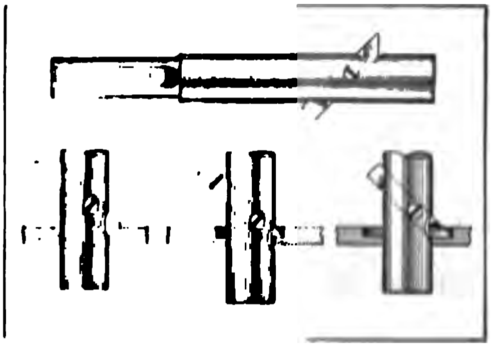


A Sandpaper Block, Made by Notching a Piece of Wood and Covering One Side with Leather, Which Permits Adjustment for Use on Curved Surfaces

ing a piece of heavy leather to a split block, as shown in the sketch. The block is first grooved and finished, as indicated. The leather is then glued to the lower surfaces. The sandpaper is cut to the proper size and glued to the leather. For sandpapering concave surfaces the upper side of the serrated block is squeezed together. For convex work it is spread apart.—Robert M. Thomas, Cheyenne, Wyo.

Adjustable Counterboring Tool Has Many Applications

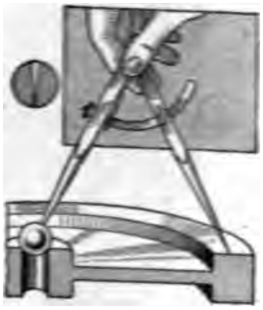
Mechanics whose work calls upon them for a variety of counterboring jobs will instantly recognize a wide range of applications for the adjustable tool illustrated. Any desired size or shape of counterbore may be made with the one tool, depending upon the setting that is given the cutting member, or the angle to which it may be ground. The cutters are of high-speed steel, and if the hole in the bar is to be made exactly, so the cutting edge is measured with a protractor and ground accordingly. The bar is made of milled steel and should be casehardened.—M. [illegible], Livermore, Calif.



The Sketches Illustrate Various Types of Counterboring Jobs to Which the Tool Is Applicable. As will be Noted, It Is Adjustable for Shapes as Well as Sizes of Counterbores

Sphere Attachment for Dividers When Measuring from Holes

It is sometimes necessary to mark castings a given distance from drilled holes. For such work a sphere attachment for the dividers, as illustrated, is useful. A smooth cast-iron or steel sphere having a tapered hole to take the divider point is secured, and is used as shown in the sketch. This attachment permits much greater accuracy than is obtainable by the use of a center-marked rivet or bolt.—W. H. Thomas, Davenport, Ia.



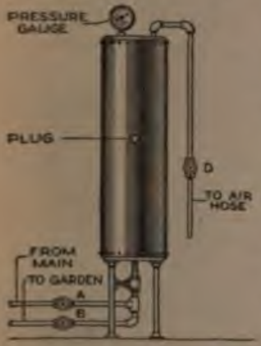
Formula for Making Strong Asbestos Plaster

Asbestos, or magnesium, plaster, as ordinarily applied to large tanks and hot-well pipe joints, is sometimes lacking in mechanical strength although satisfactory as a heat insulator. By mixing in the plaster 100 parts of asbestos fiber, 8 to 10 parts Portland cement, and 6 parts of common salt, a material is produced which has both strength and weather-resisting properties.—Maurice St. Johns, Montreal, Quebec, Canada.

Oil Conserved by Using Soapy Water

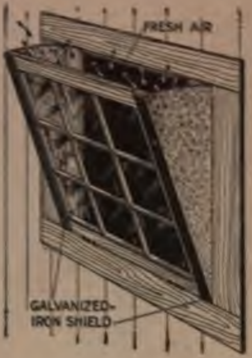
In several railroad repair shops soapy water is being used successfully as a substitute for oil in mandreling and working boiler flues. It is not only much cheaper than oil, but reduces the danger of having the expander pin fly out, as frequently occurs when oil is used as a lubricant.

Inflating Tires with Air by Use of City Water Pressure



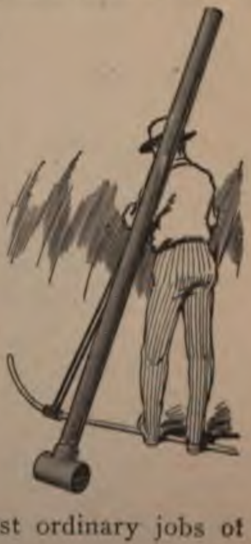
In communities where the city water pressure is 70 lb. or more, a tank may be connected up with little difficulty to supply air under the same pressure as the water. This is best accomplished with an old hot-water boiler, as illustrated. The pipes A and B are provided with separate shut-off valves and lead into the bottom of the tank through a connecting pipe which is also provided with a valve. A pressure gauge is fitted at the top of the tank, and the air pipe is fitted with a valve, D, as in the sketch. To inflate a tire the hose from the air pipe is connected with the tire valve. The valve in the outlet pipe B is closed while the valve in the connecting pipe under the base of the tank is opened. The valve A is then opened, and as the water rises in the tank, the air is compressed and forced through the pipe D into the tire. After the tire has been filled to the requisite pressure the water is turned off, the valve B is opened and the water drained out to irrigate the garden. The plug in the middle of the tank is fitted with a tiny glass-covered port so that it may be determined when the water level passes that point.—R. J. Midgley, Menlo Park, Calif.

Draft-Proof Window for Small-Shop Ventilation



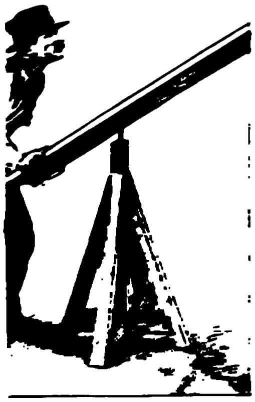
In addition to the feature of providing ventilation without the usual drafts of ordinary windows, the structure illustrated has the advantage of excluding rain when open. The galvanized-iron shields exclude side drafts, and all ventilation is effected from the ceiling downward. Any ordinary window may be rebuilt into a window of this type. It is only necessary to hinge it at the bottom, provide the side shields and the grooves in the sash into which these fit. Windows of this type will help prevent colds that follow vigorous work near an ordinary window.—H. A. Shearer, Chicago, Ill.

A Simple Pipe Bender for Home or Shop Use



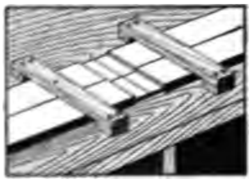
A pipe bender of such simplicity that anyone can make it is formed by combining a tee connection with a length of pipe, as shown in the sketch. The tee and the pipe used for the handle should be of a diameter slightly greater than that of the stock upon which it is to be used. By slipping the tee over the pipe and operating as illustrated, satisfactory work is accomplished on most ordinary jobs of pipe bending.

Pivot Stand Aids in Handling of Rough Lumber



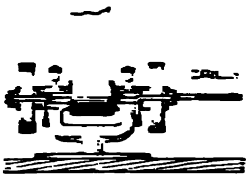
Wherever quantities of rough lumber must be loaded, unloaded, or piled, a pivot stand, as shown in the sketch, is of great assistance in the work of handling. Such a stand consists of a central upright erected on two crossed bottom pieces, the ends of which are mortised into four slanting legs which grip the upper part of the central piece. Into the end of the upright is set a stout steel pin having a rather blunt point. The stand is placed alongside the wagon or lumber pile and is used as a pivot where leverage accomplishes much of the work ordinarily done by actually lifting each board.—Henry Simon, Laguna Beach, California.

Rapid and Accurate Method of Making Tenons



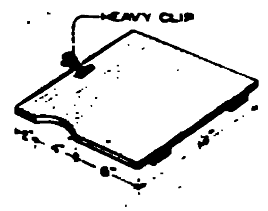
The following manner of making tenons gives better results than the usual method, and takes less time than the ordinary way. After making the saw cuts determining the length of the tenons on the pieces, roughly shape the tenons to within $\frac{1}{16}$ in. of the desired thickness. Then place the pieces in pairs opposite each other, as shown. Clamp them down, placing a piece of sandpaper, folded double so as to present two sanded sides, between the clamping strips and the pieces to be worked. This prevents slipping. With a router plane, level off the depressions; reverse the work and level off the opposite sides. A set of tenons of unvarying accuracy will result.

Boring Small Machine Parts after Grinding



Where a large number of small machine parts must be ground and drilled, much time and labor is avoided if the emery wheel is provided with the proper size of drill, as illustrated. This is best accomplished by boring the drill socket in the center of the wheel shaft, and locking the drill in position with a countersunk setscrew. Thus equipped, the operator is able to complete the two operations without changing his position.

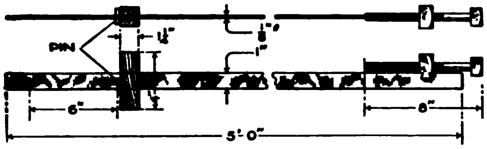
Handy Writing Board for Shop Material-Checking Work



For inventory or the checking in of shop materials, a writing board made of light wood, and of the dimensions illustrated, is a great convenience. The cut-out portion near the corner should be about 4 in. in width and 1 in. deep. The board should be sandpapered smooth and given two coats of spar varnish. In use, the board rests on the left forearm, the curved portion fitting into the angle formed by the elbow. It is easy to hold the board in this position, which will be found convenient for writing. A spring clip mounted near the upper edge keeps one's papers from blowing away or being misplaced when the board is tilted or set down. Stockroom clerks and shop foremen will find such a board useful in their work.

A Handy Clamp Made from Waste Materials

There are numerous clamping operations about the average small shop where a clamp of the type illustrated is useful, but if purchased ready-made, such clamps are almost prohibitive in price. A very serviceable article is made from an iron bar and an 8-in. machine bolt, as shown in the sketch. A threaded block is provided for the bolt and attached by means of a keystone notch to one end of the bar. The other end of the bar is provided with a hardwood block, as shown. This block is made adjustable by being fastened with a steel pin, which may be set in various holes along the body of the bar. The finished clamp is very powerful as well as almost instantly adjustable for any variety of work.—Norman Harris, Toronto, Ont., Canada.



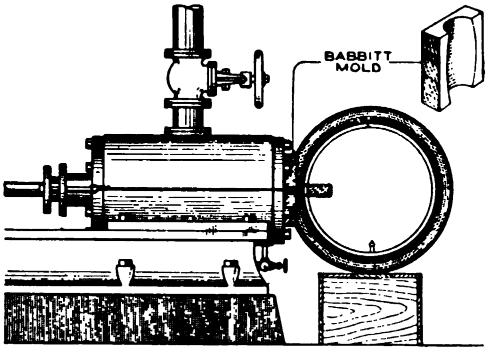
A Powerful Clamp, Having a Wide Range of Application, Which may be Made from Waste Materials Usually to be Found about the Small Shop

Method of Preventing Binder Canvas from Ripping

To prevent grain-binder canvas from ripping, rivet a leather strap along the underside outer edge. A rivet should be placed near the end of each slat to allow for stretching in the canvas. Ordinarily the canvas wears through first at the end of the slats. The leather strap will prevent this.—Stanley Dougan, Pawnee, Okla.

Device for Vulcanizing Tires on Steam-Engine Cylinder

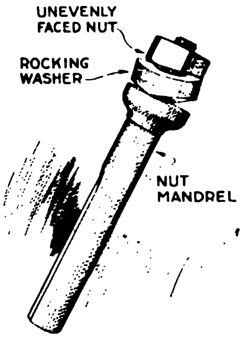
Wishing to retread a motorcycle tire and not having a vulcanizer, I improvised an outfit which did the work satisfactorily. A mold to fit the tire was cast from babbitt metal and propped against the engine cylinder until thoroughly hot. The tire was then placed in position and clamped by means of a stick put through it and wired to a bolt on each side of the cylinder, as illustrated. With 80 lb. of steam it took about an hour to thoroughly vulcanize a section of a 3-in. casing. A larger tire would of course take more time.—M. C. Metzer, Silver Creek, Neb.



By Utilizing the Heat of a Steam-Engine Cylinder Satisfactory Vulcanizing may be Accomplished with the Aid of an Improvised Babbitt Mold

Mandrel for Truing the Faces of Nuts

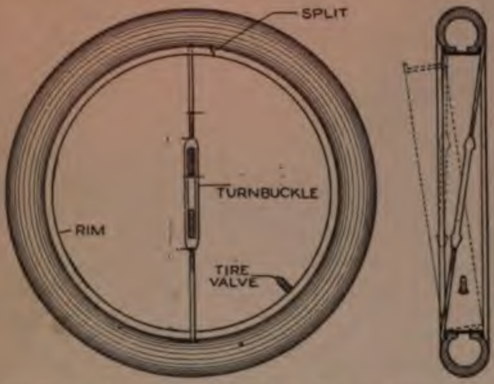
The most unevenly faced nut may be quickly trued with the aid of the rocking-washer mandrel illustrated. Regardless of how uneven the face of the nut may be, it may be turned down securely on the threads of the mandrel. The mandrel is then placed in the lathe and the surface of the nut is marked and faced off. The mandrel is made from tool steel, or milled steel thoroughly casehardened.



¶In tinkering on automobile engines, searching in the mud pan for dropped tools and parts may be avoided by stuffing sacking into the space between the engine and chassis frame.

Serviceable Tire Remover for Cars Equipped with Split Rims

By fitting rods with hooked ends into a double-threaded turnbuckle as illustrated, an excellent tool is provided for removing tires from split rims. In use, the hooks are engaged on the opposite flanges, one of them being placed near the division point of the rim. By then tightening the buckle to give the necessary contraction, the tire may be easily removed.—Fred Reschke, Racine, Wis.



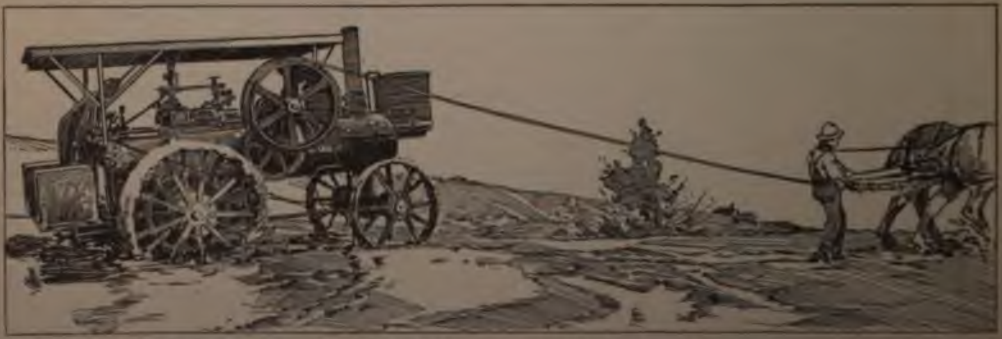
By Tightening the Turnbuckle the Rim is Contracted Until the Tire is Disengaged

Heavily Laden Fruit Trees Braced with Wires

Heavily laden fruit trees, having a central main stem or trunk, may be effectively supported by using lengths of wire for supporting the lower limbs from a point above on the central member. Both the trunk and the limb should be well padded before the wire is applied, and care should be used to see that the wire does not bind the bark on more than one side. After the padding is placed, the wire is extended between the two points in double strands. A stick is then thrust between the wires, which are twisted to draw them taut. When one limb has been thus supported it is best to wire the next limb on the opposite side of the trunk, and so on, until the tree is wired on all sides.—C. J. Lawless, Lincoln, Neb.

Novel Method of Getting Tractor Out of a Mud Hole

While being driven across country a large bull-wheel tractor became mired so badly that it could not pull out on its own power. A team of heavy horses were hitched to the machine, but were unable to move it. The method illustrated was tried, and the tractor came out of the hole with very little effort. Brush was placed in front of the bull wheels to form a hold for the strakes. The clutch was let in and then 100 ft. of stout rope, which had previously been wound about the power wheel, was unwound by hitching the horses to the end. The pulling power of the horses was thus exerted through the driving gears, creating a force far greater than the resistance of the mud and the weight of the machine. The rope had to be unwound from the power wheel several times before the



By Applying the Pulling Power of a Team of Horses to the Unwinding of a Rope from the Power Wheel, the Force was Transmitted through the Gears to the Bull Wheel of the Tractor

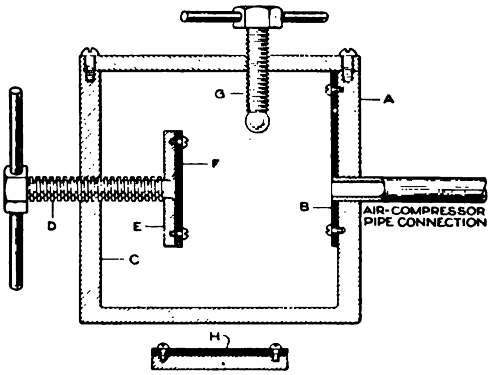
tractor was clear of the hole, but the work was quickly done and with little difficulty. For this odd application of power, the cylinder cocks of the engine were opened to relieve compression.—Carl William Thies, Cedar Falls, Ia.

Reamer for Accurate Work in Wood

It frequently happens that holes in wood must be bored to give a very accurate fit, such as a light wedging fit, or a snug sliding fit for a pin. For such work a beveled-end reamer, as illustrated, is of great service. The reamer is made by beveling off the end of a piece of cold-rolled steel of the required size and slotting it with a hacksaw and file, as indicated. The faces of the cut should be smoothed with a fine file, using care to keep the cutting edges intact. The knife-edges of the **reamer will cut out all projecting material and the notch will collect the shavings.**

Efficient Method of Testing Motor Journal Bearings

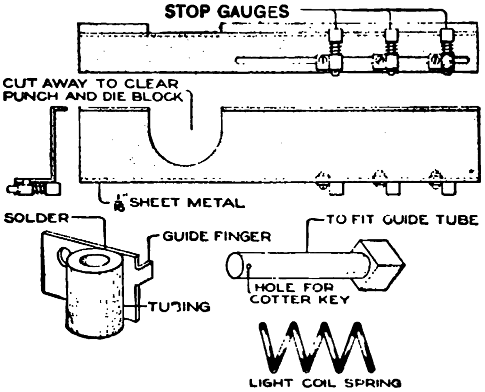
In plants provided with an air compressor a practical method of testing journal bearings for possible leakage is shown in the illustration. This consists of a cast-iron frame, large enough to accommodate the bearing. The side A, in addition to being equipped with air-compressor connections, contains a rubber pad, B, through the center of which a hole has been drilled to permit the passage of air. The other side, C, contains an adjusting screw and handle D. The end of the screw is fitted with a loose cast-iron cylindrical plate, E, to which is also bolted the rubber pad F. The ball-pointed screw G, passing through the top, is used in conjunction with the block and pad H. The journal box to be tested is placed in this rigging and held in position by the screw D. The block H is placed over the cover opening and clamped down by the ball-pointed screw G. This renders the bearing entirely air-tight, and by turning on the inlet valve forming part of the air compressor it is a simple matter to detect any flaw, which is then remedied by plugging the holes with lead. This method of testing reduces to a minimum any motor-bearing trouble arising after the finished product has left the factory.—Frank H. Rapp, Atlanta, Ga.



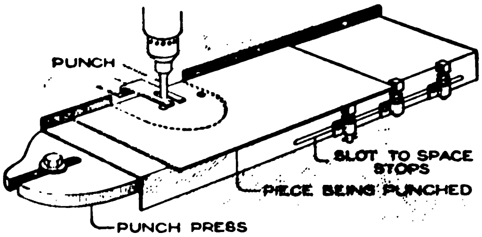
Motor Bearings are Held in This Frame While Flaws are being Located by the Use of Compressed Air

Spacing Gauge for Power-Punching or Drilling Sheet Metal

When a number of pieces of material are being punched, or drilled, simultaneously, a spacing gauge, as indi-



Component Parts of the Punching and Drilling Gauge Showing the Details of Construction Essential for Constructing It cated in the sketches, will be found of material assistance in attaining the degree of accuracy desired. Best results are obtained by bolting the gauge securely to a hardwood board and in turn bolting the board to the drill-press, or punch-press, table. While three stop gauges are shown in the illustrations, these may be arranged to suit individual requirements.



The Punching and Drilling Gauge in Operation: With Its Aid All Guesswork is Eliminated and Spacing Becomes a Matter of Mechanical Accuracy

Tank for Cleaning Screw-Machine Products

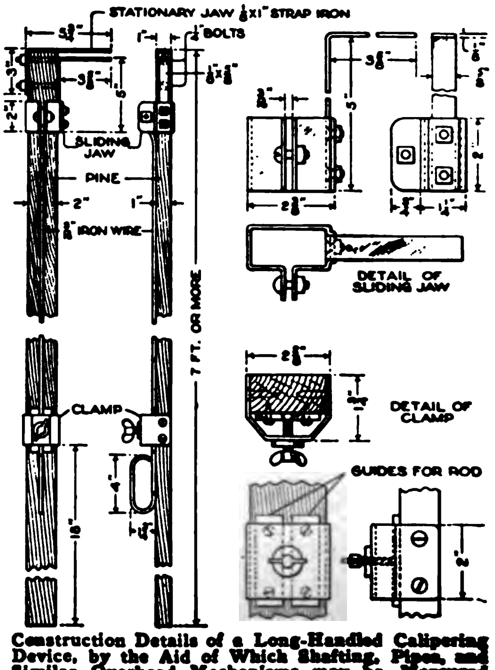
Small manufacturers not desirous of installing an elaborate system for removing the oil from screw-machine parts after completion, will find the following simple method useful: Construct a sheet-iron tank, about 24 in. deep and 24 in. square, and erect it in such a position that a steam pipe line passes through it. Fill the tank with a solution of 5 to 6 lb. common washing soda and water. It is necessary to skim the surface occasionally to remove the oily matter caused by frequent immersions in order to insure clean soda water at all times.—Joseph Plogman, Cincinnati, Ohio.

Selecting Wood to Take an Ebony Finish

Any close-grained wood may be ebonized, but the most satisfactory wood is cherry. For small articles, birch, persimmon, apple, or pear wood may be used, the latter being the favorite wood for piano keys. Woods having prominent medullary rays, like quarter-sawed sycamore, maple, or beech, are not so good as wood with an even-grained surface, similar to the grain of ebony. Whitewood or poplar, basswood, and similar woods, are used for cheap work, but woods like ash, oak, and elm are not suitable for ebonizing, as the cellular grain prevents the resemblance of ebony. The same is true of pine and cypress, or any other woods with broad grains of different texture.—Charles A. King, Plymouth, New York.

Calipers for Overhead Work Eliminate Use of Ladder

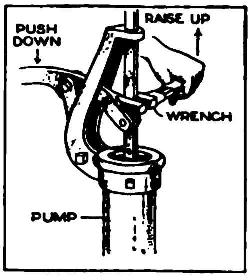
Ladders are usually treacherous, and this is especially true when they are used on the frequently greasy floor of machine shops or around machinery in operation. For calipering shafting, pipes, and other shop equipment that is out of reach from the floor, the stick illustrated is both a saver of time and a promoter of safety. The stick should be made from oak, or other clear, hard wood. The metal fittings may be of any grade of steel that is soft enough to be readily worked. In use, the upper jaw is passed over the object to be



Construction Details of a Long-Handled Calipering Device, by the Aid of Which Shafting, Pipes, and Similar Overhead Mechanisms may be Measured without the Use of a Ladder measured. The lower jaw is moved until it is in firm contact with the lower surface, and is locked in that position by tightening the wing nut controlling the clamp mechanism on the handle. The size of the object calipered is then determined by measuring the distance between the caliper jaws with a ruler.

Efficient Method of Recovering Pump-Jack Rods

When connecting a pump-jack rod with a windmill, great difficulty is often experienced because of the rod dropping down so the connecting pin cannot be passed through. Such fallen rods may be easily pulled back by gripping them with a monkey wrench as shown in the sketch. After being applied, the handle of the wrench is pulled upward until the jaws take a firm hold on the rod. The handle of the pump is then used as a lever to pull the jack rod into place.—Will F. Benzel, Rockford, Ia.



Extension Control for Tractor Aids in Work of Plowing

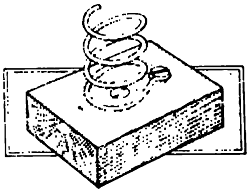
When pulling a riding plow with a tractor, more efficient work is accomplished if one is on the plow. To accomplish this I have fitted my tractor with an auxiliary control, as illustrated. An old automobile steering wheel was purchased in a junk yard, and a little blacksmithing in the farm workshop completed the control system. Two ½-in. rods, connected, just above the drawbar, with a universal joint and fastened to the tractor steering wheel and to the second wheel, furnished the extension guide. The rod was fastened to the tractor by making a "U" on the end and running the ends through the spokes of the steering wheel and on through an iron bar which was bolted in place. Supporting rods were also attached to the tractor and to the plow.

The Auxiliary Tractor Control Enables the Operator to be on the Riding Plow and to Handle Both Machines with Maximum Efficiency and Ease

Two lines, one from the clutch lever, and one from the speed and reverse lever, were used to control the tractor. These were attached to the plow with the aid of two old binder levers, which serve as controls. With this method excellent results are obtained. I often work the tractor for two or three hours at a time without the necessity of stopping for anything.—Charles N. Garber, North Manchester, Ind.

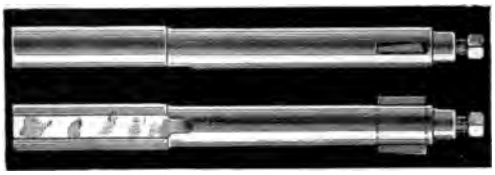
An Improvised Electric-Light Socket

Needing an extra electric-light socket and having none available, I contrived one from a piece of spring wire as indicated in the sketch. Two stove bolts were set in a block of wood. These protruded into a groove on the underside of the block and were used for the wire connections. The spring was wound to fit the threads of the outside electrode of the globe and contact was made with the central electrode by turning the globe down against the bolt in the center of the coil. The makeshift gave thoroughly satisfactory service.—George Perkins, Millburn, New Jersey.



Tool for Conserving Small Pieces of High-Speed Steel

With the present scarcity of high-speed steel, the necessity for conserving this material has been brought home to both large shops and small. The tool illustrated permits a wide range of boring operations, utilizing the small scraps of high-speed steel that ordinarily go to waste. The shaft is of milled steel, hence is inexpensive and easy to make. The cutters, being held by a setscrew in the end of the tool, are readily removable for grinding.—L. M. Rowley, Livermore, Calif.


This Tool, Which may be Used for a Variety of Boring Jobs, Has Cutting Members Made from Small Scraps of High-Speed Steel That Usually are Wasted

A Holdfast Leather-Belting Cement

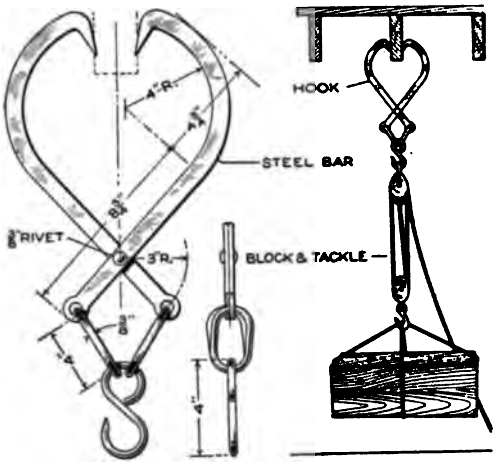
Scraps of waste celluloid, such as old film, combs, and similar articles, dissolved by agitation in methyl acetone to produce a thick sirupy solution, make an excellent leather-belting cement. Belting thus cemented is both flexible and waterproof. It should be borne in mind that the ingredients of this cement are highly inflammable and should not be mixed or used in the vicinity of any open flame.—Leon A. Haloin, Denver, Colo.

Emergency Bearing for Tractor Made from Oil-Soaked Maple

While being operated in a section of country remote from any repair shop, or source of machine supplies, a tractor engine burned out a main-shaft bearing. Without some sort of an emergency repair the machine could not be driven, and to have fitted a new bearing without having the machine in a repair shop would have been practically impossible. As an experiment a bearing was made from a piece of hard maple. It was boiled in cylinder oil for several hours to impregnate the wood thoroughly and was then placed in the machine. With the wooden bearing the machine was run slowly and with an abundance of oil until it became apparent that the wood was developing no signs of heating. The tractor was put to work with this makeshift repair and gave satisfactory service until it could be taken to a shop for a more permanent job.—C. C. Cook, McMinnville, Tenn.

Hoisting Hook Has Instantaneous Positive Grip

An exceptionally handy hoisting hook for use in basements, warehouses, and other places where there are overhead rafters, is made as indicated in the sketch. Such a hook may be instantly attached for use wherever needed. Up to the limits of its capacity and that of the supporting beam, the prongs take a more positive grip the greater the strain imposed upon it. The dimensions given in the sketch are designed for comparatively light work. For heavier lifting, they should be increased according to requirements.



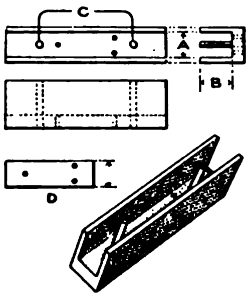
In Shops, or Other Places Where There Are Overhead Beams or Rafters, This Portable Hoisting Hook may be Instantly Applied

An Emergency Spark-Plug Repair

The writer was caught in a rainstorm. Water struck the spark plug of his motorcycle and cracked the porcelain insulation. This short-circuited the plug, as the spark jumped through the crack. Temporary repairs were made by removing the upper broken porcelain, and placing ⅛-in. dry-paper washers in the break. Then the plug was reassembled and fastened in place. The plug worked satisfactorily until home was reached.—Bernard Bergman, Belleville, Ill.

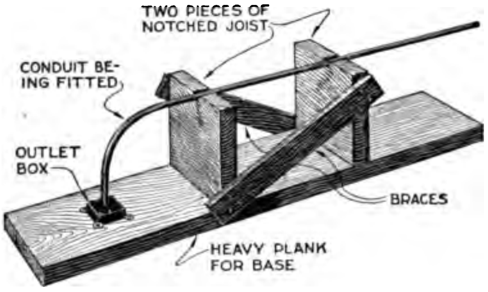
Jig for Drilling Small Sheet-Metal Pieces

Where a large number of small, thin, square or rectangular pieces of sheet metal or brass, having in them one or more holes, are to be drilled, an effective jig can be constructed with little work from a block of steel, as shown in the illustration. In using this jig the pieces to be drilled are piled in the groove of the block. A finished piece, D, which serves as a template to locate the holes accurately, is placed on the top of the others when the contrivance is being used. In width the block should be equal to the dimension. A plus ¼ in. Its length should be such that it can, when in use, be held securely and safely by the hand. The slot is milled of such a width that the pieces which are to be drilled can be placed in or taken out of it easily. However, it should not be too wide because this would impair its accuracy. The depth, B, should be such that several pieces can be accommodated and drilled simultaneously. Two guide pins, C, driven in drilled holes, prevent longitudinal motion of the pieces.



Device for Bending Conduit Elbows

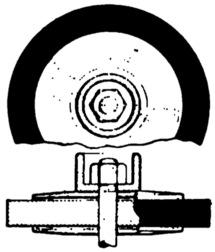
When bending conduit elbows for ceiling outlets, it is often desirable to arrange a form, as illustrated. The heavy end pieces are sections cut from a joist, of the same depth as those used in the building in which the installation is to be made. The plank for the base should be at least 5 ft. long and 2 in. thick. An outlet box of the type being used is mounted on the plank, as shown. After each bend is formed, it is tried in this template as it lies on the floor. The correctness of fit is thus determined without the necessity of taking the conduit to the location in which it is to be installed.—G. G. Hartman, St. Louis, Mo.



With This Simple Device Electrical Conduits are Quickly Bent to Fit in the Location in Which They are to be Installed

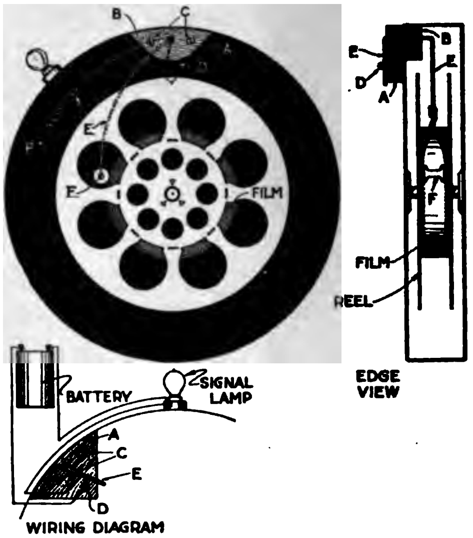
Safety Washer for Fastening Emery Wheels

The safety washer for fastening emery wheels, shown in the sketch, was adopted recently by the safety commission of a great manufacturing state. It is turned from a single piece of steel, which serves as a box into which the nut is set deep enough to avoid all possibility of one's clothing becoming entangled. A socket wrench is, of course, used in the application and removal of wheels with this type of fastening.—Rollin C. Woodford, Meadville, Pa.



Automatic Signaling Device for Projecting Machines

Modern motion-picture projecting machines are provided with mechanism for automatically notifying the operator

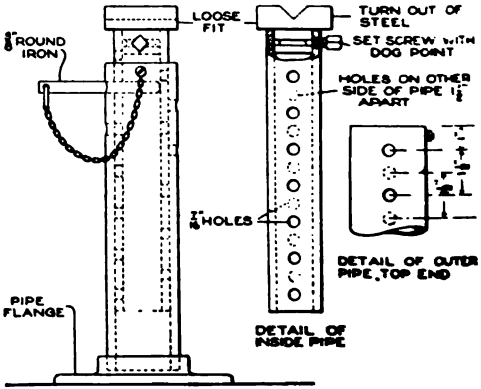


Construction Details of a Simple Electrical Signal for Old-Type Motion-Picture Projecting Machines: By Its Use the Operator is Notified When the End of the Reel is being Approached

when the end of a reel is being approached. The lack of any such mechanism on many old types of machines, still in use, is frequently a source of annoyance to operators, exhibitors, and audience alike. These old-style machines may be modernized in this respect by the installation of the automatic signaling device illustrated. It consists of a simple form of electrical contact by which a globe is lighted to notify the operator whenever the reel nears its end. This is accomplished by means of a contact spring, E, with a small roller on the end F, which presses against the film, descending as the film is unwound, and closing the circuit when all but a small portion of the film has been shown. Referring to the drawing it will be noted that the spring is mounted in the machine upon two wooden blocks, A and B, which are fastened by means of [illegible] C. The other end of [illegible] the roller, rides o[illegible] the reel is star[illegible] contact segment away from the circuit point D, until the reel is nearly finished. As the film passes through the machine during the exhibition, the roller F gradually sinks toward the axle of the reel. Eventually the opposite end comes against the contact screw D, forming the circuit to the light, and signaling the operator.—A. F. Andrews, Chicago, Ill.

Adjustable Supporting Stand Substitute for Jackscrew

An adjustable stand, the construction of which is disclosed in the illustration, has been found very useful in the shop for supporting frames of machines, or similar objects, which are being assembled or repaired. It may be substituted effectively for the usual jack. It is safer than the latter and its first cost is lower. The base is a standard floor flange. The vertical column is a length of wrought-iron pipe, threaded at the end which screws into the flange. The movable shaft is another piece of pipe, its diameter being such that it will slide easily within the pipe column. A ⅜-in. pin, cut from cold-rolled steel, constitutes a key whereby the shaft may be held at any desired height. Equidistantly spaced holes, $^7/_{16}$ in. in diameter, are drilled in the shaft and column for the key. The



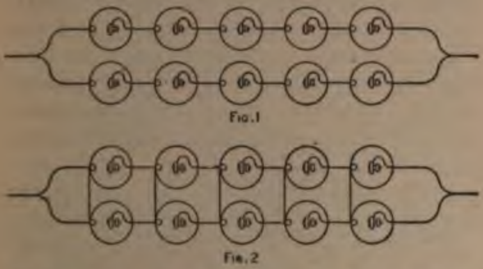
The Stand Is Useful on the Assembly Floor. The Lock Is Positive and cannot be Released by Accident

[illegible]y should be chained to [illegible] will not be [illegible]

V-notch machined across its upper face. An annular groove is turned in its lower extension. Into this groove a setscrew with a dog point engages. The point of this setscrew should fit loosely in the groove so that the V-notch may be rotated to any desired position.

Electric Ignition System Wired to Counteract Loose Connections

Electrical ignition systems are frequently operated upon low voltages from primary batteries, storage batteries, or low-pressure generators. The power required is very small, and on this account batteries are much used. The primary voltage is generally about six volts and the series-multiple connection, shown in Fig. 1, is usually employed. If additional cross connections are made, as shown in Fig. 2, a loose connection in one series of batteries will not render the entire series useless.—Peter J. M. Clute, Schenectady, N. Y.

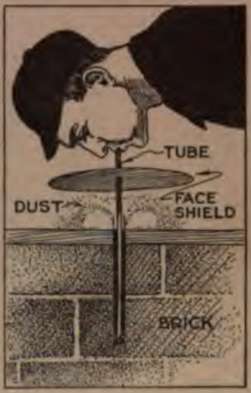


By Providing Cross Connections, the Entire Series is Not Rendered Useless Because of a Loose Contact

Fixing Compass-Point Centers on Drawing Sheets

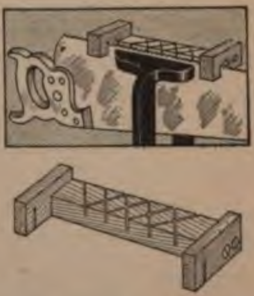
When a large number of circles are drawn from the same compass center a hole is ordinarily worn in the paper. It thus becomes impossible to draw circles or arcs concentric with each other. To remedy this, glue a small piece of celluloid over the center to take the point of the compass. Such compass-point centers may be removed from the drawing, when completed, with a knife.

Holes Drilled through Brick and Mortar



In wiring an old house for electricity, the workmen had to drill a vertical hole through several layers of wood, brick, and plaster. The only tool that could do the work was a drill bit with a short auger section and a long shank. After the hole had been drilled a few inches it began to clog, as the fine dust would not lift out. It packed hard at the bottom of the hole and hampered progress. Then a short piece of tubing was thrust into the hole. When the workman blew into the tube, the dust came out in a jiffy. A shield of paper around the tubing protected the workman's face. The operation was repeated as often as necessary. — Dale R. Van Horn, North Loup, Neb.

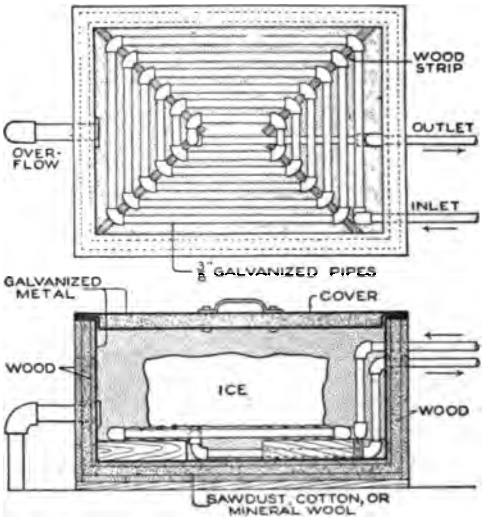
Guideboards Are Great Aid for Correct Saw Filing



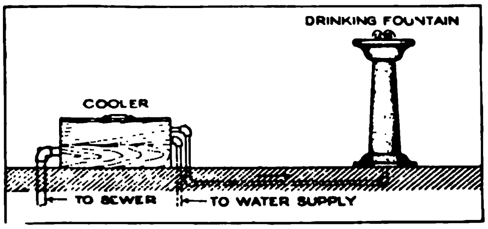
The difficult job of filing a saw properly is rendered much easier by the use of an angle guide board, as shown in the drawing. Such a guide board is readily made from three pieces of wood. After being fitted over the saw blade the correct angles for filing are located with a ruler and pencil and made permanent with saw cuts. When filing the saw the file is kept in line with the guide marks, thus eliminating all guesswork as to the correctness of the angle of filing.

Cold-Water System with Cooling Coil in Supply Pipe

Any shop can have a continuous supply of cold drinking water by installing an equipment such as that shown in the accompanying diagrams. The cooling coil, which is inserted in the water-supply pipe to the drinking fountain, is assembled from malleable-iron elbows and pipe nipples. To prevent excessive radiation, heat-insulating materials are incorporated in the sides and cover of the box. Ice is packed on top of the cooling coil. Water which flows to the fountain is thereby cooled. An overflow pipe from the cooler leads to the sewer, to carry away excessive water from the melting ice. This cooler may be installed at any convenient location, but preferably should be near the fountain so that the temperature of the water will not be raised appreciably in flowing from the cooler to the fountain. It is desirable to inclose the pipe between the cooler and the fountain in a magnesia or similar heat-insulating covering.—C. C. Spreen, Flint, Mich.


WOOD STRIP
OUTLET
OVER-FLOW
INLET
$\frac{3}{8}$" GALVANIZED PIPES
GALVANIZED METAL
COVER
WOOD
ICE
WOOD
SAWDUST, COTTON, OR MINERAL WOOL

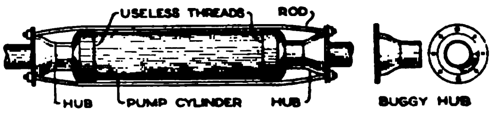
A Simple System for Providing a Continuous Supply of Cold Drinking Water in a Shop



Diagrammatic View of Pipe Connections between Cooler and Drinking Fountain, Water Supply, and Drainage System

Buggy Hub Used for Repairing Worn Threads of a Pump Cylinder

A farmer whose crops were threatened with injury because of the failure of an irrigation pump, effected the temporary repair illustrated. The threads of the cylinder caps had stripped, allowing the cylinder to pull apart and rendering the pump useless. An old buggy hub was cut in two, and the halves were passed over the jack rod, as indicated. Through holes previously drilled in the spoke flanges, two steel rods were inserted. The ends of these rods were threaded and nuts applied for pulling the entire mechanism together. This makeshift repair produced a water-tight cylinder, which gave satisfactory service until a new one could be procured.—C. C. Jackson, Roanoke, Ind.



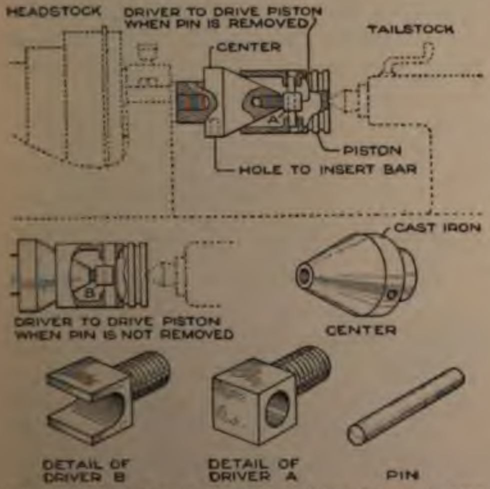
The Halves of a Buggy Hub were Used to Secure a Connection for Threaded Steel Rods Which Held Together the Caps of a Pump Cylinder from Which the Threads had been Stripped

Chalking a Tap to Get a Perfect Fit

It is always desirable to get a perfect fit for steam, air, or water-tight work on studs, plugs, patch bolts, and similar jobs where tapered taps are used. A simple method of determining the exact size of a tapped hole is to chalk the tap with ordinary white chalk, and then run it into the hole. When the tap is screwed into the hole the chalk is removed due to the friction of the metal against the tap. After the tap has been run in as far as it will go, it is taken out. The chalk will not show on the tap up to the point where it went in. By calipering the tap where the chalk begins the thickness of the metal around the tapped hole is determined, and the stud, plug, or patch bolt is turned up accordingly.

Chuck Which Centers and Drives Pistons being Machined in Lathe

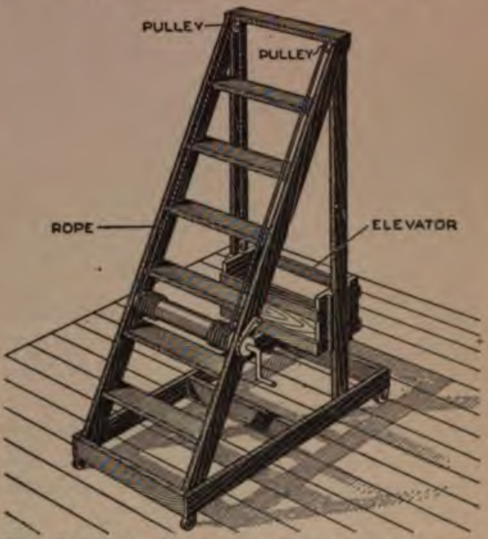
Where a number of pistons are to be machined in a lathe the arrangement illustrated will greatly simplify the setting-up operation, inasmuch as it centers automatically the piston in the tool. Furthermore, the driving device suggested transmits effectively the rotary motion from the lathe head to the casting which is being turned. The conical center, which is of cast iron, is threaded so that it will screw onto the lathe spindle. This construction, though convenient, is not necessary, for the center may instead be clamped in the lathe chuck. Either one of two driving devices may be employed. If the pin cannot be removed from the piston, the driver may be of the form detailed at B. When the pin can be removed, a driver of the design shown at A can be utilized. A hole should be drilled in the center casting into which a lever is inserted when unscrewing the center.



The Tapped Hole in the Nose of the Lathe Center Automatically Centers the Casting and Holds It for Machining

Combination Stepladder and Portable Elevator

This device is a combination of an elevator and a stepladder. When used as a stepladder, or scaffold, it can be moved readily from place to place on its rollers. As an elevator it can be employed for raising to high shelves, for storage, relatively heavy loads, such as sacks of flour or cases of canned goods. However, its most useful application is, probably, in gathering fruit. The gatherer has free use of both hands and the fruit can be placed in the crate on the elevator. In masonry construction, bricks can be carried in the elevator box so that they will always be at a convenient height for rapid handling.—R. Lee Sharpe, Carrollton, Ga.



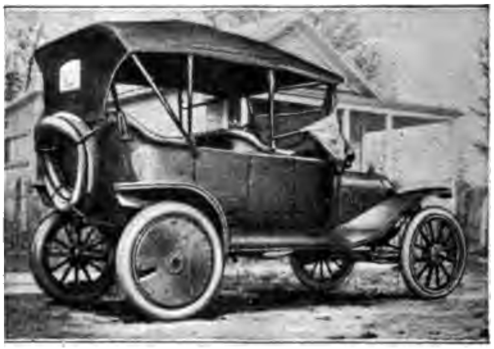
This Combined Ladder and Elevator Is Handy in the Store or Shop, and can Also be Used by a Fruit Picker or a Brick Mason

Dehydrating Denatured Alcohol

To remove excess water in 190° denatured alcohol, I added 4 oz. calcium carbide to each gallon of denatured alcohol. After the bubbles of acetylene gas had ceased, I filtered the alcohol in a funnel and obtained a practically water-free alcohol.—Leon A. Haloin, Denver, Colo.

Effective Emergency Repair for Automobile Wheel

In the photographic reproduction is shown how a broken automobile wheel was quickly and effectively repaired on the Valdez Trail, Alaska, 150 miles from any automobile-supply station. After the repair, the machine was driven without failure over bad roads for 250 miles. In constructing the improvised wheel, six pieces of board, each 1¼ in. thick, and the old felloe were used. The only tools employed were a brace and bit, a saw, and a hammer. The six boards were assembled and sawed into three disks giving a total thickness of 3¾ in. The boards were so placed that the grain of the wood crossed in adjacent layers. Two of the wooden disks were of the same diameter as that of the outside of the felloe. The inner disk was sawed to fit tightly inside of the felloe. Six bolts passing through the felloe and two outer disks clamped the parts together. A hole was bored through the center of the three disks for the hub. The old hub was used, with spoke flanges on the outside. A notch was cut in the outside and center disks to permit access to the tire valve. Then the wheel was ready for use. It required only two hours to build it. A small piece of board with a nail driven in each end was used as a compass for striking the circles.—John S. Griswold, Fairbanks, Alaska.



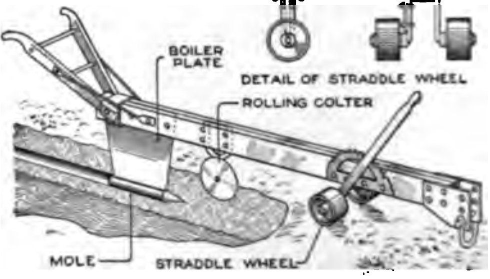
The Right Rear Wheel of This Automobile is Made from Three Wooden Disks Fitted to the Old Hub and Felloe, After the Spokes had Broken. The Car was Driven 250 Miles with It

Iron Cement Made from Old Dry-Cell Filler

The black filler material from old dry cells, when combined with powdered iron and Portland cement, makes an excellent iron cement which is suitable for a variety of purposes. The proportions are: cement, 15 oz.; powdered iron, 20 oz.; battery filler, 5 oz. All this material must be perfectly dry when mixed and as fine as possible. Any moisture will set up a chemical action that will set the mixture. Cement powder will keep indefinitely if stored in a dry place. When desired for use, it is only necessary to add water to make a thick paste and apply.

Mole Plow Makes Subsurface Drain without Use of Tile

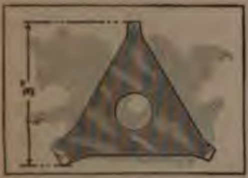
The mole plow shown in the sketch has been used successfully for draining the ground about several American army cantonments and by farmers in the cultivation of low, marshy land. The mole, which is made of hardened steel, makes a 4-in. hole 15 in. to 18 in. underground as fast as the plow can be drawn along by horses or machinery. Its construction presents no difficulty that cannot be overcome in the average shop. The handles are taken from an old walking plow, while the straddle wheels and lever for controlling same are from a grain



Boggy Ground is Quickly Drained through the Underground Hole Left by the Passage of the Steel Mole binder. This mechanism serves to regulate the depth at which the plow is to travel. The rolling colter, like the plow blade, is made from a piece of boiler plate. Its function is to cut all roots and sod in the path of the plow blade.—E. R. McIntyre, Madison, Wis.

Triple-Bladed Pocket Screwdriver

A pocket screwdriver like that here illustrated costs practically nothing to make, weighs little, and occupies a minimum of space in the tool chest or pocket. On the other hand, with it, most of the operations possible with larger screwdrivers can be effected. It offers instantly the proper-sized blade for each ordinary size of screw and provides a leverage entirely out of proportion to its size. A triangular piece of tempered steel, about ⅛ in. thick, is the only material needed. It can be shaped hot—or cold with a hacksaw. If a hacksaw is used, the ⅛-in. steel plate should be first annealed. Round off the edges between the blades and temper the blade points. A length between base and apex of about 3 in. will be found most convenient. If the tool is made of these proportions, it is possible to grasp it firmly without the points interfering; they will be entirely clear of the hand.



Locomotive Steam Used to Clean and Sterilize Well

Steam generated by a locomotive was, after other methods failed, used successfully for cleaning and sterilizing a well located on the line of a western railroad. A steam ejector was screwed on the lower end of a pipe, as detailed in the accompanying drawing. Then this pipe was lowered into the well casing and held with ropes so that its lower end came within about 4 in. from the bottom of the well. A flexible hose, as shown in the photograph, fed the steam supply from the boiler to the ejector. As the steam was permitted to flow through the apparatus discharging the water, workmen stirred the bottom of the well with poles. Thereby the sand and mud which had accumulated was caused to rise and, together with considerable water, was ejected through the discharge pipe. The water was heated almost to a boiling temperature. After the discharge had been operating for three hours, the water which flowed out became clear and clean, indicating that the job had been completed.

By Connecting a Flexible Hose from the Locomotive to an Injector Immersed in a Well, the Latter was Effectively Cleaned of Sand and Mud

A previous attempt made to clean the well with steam from a pile driver was unsuccessful because of the relatively low steam pressure which its boiler developed.—H. H. Isard, Caliente, Nev.

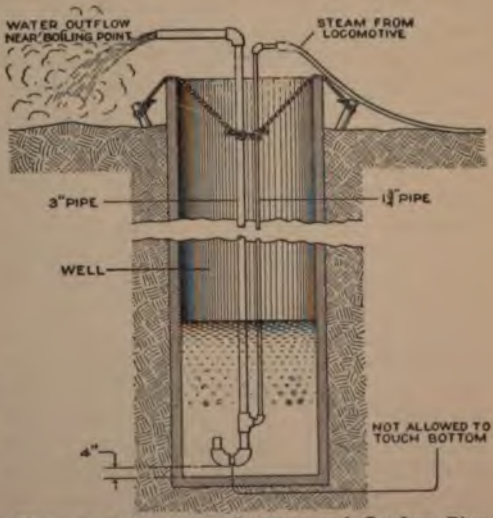
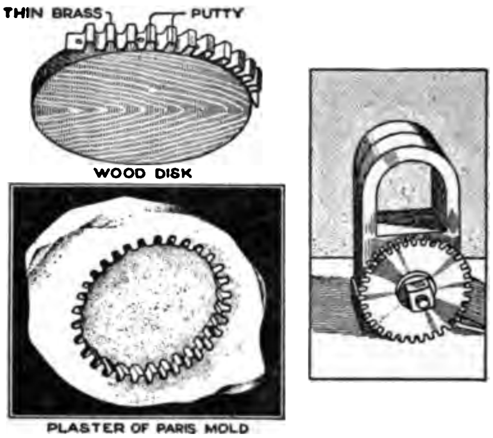


Diagram of the Steam Injector and Outflow Pipe, and the Manner of Its Suspension in the Well

Making Emergency Gear Patterns

When, in an emergency, a small gear must be cast, the following method can be employed. Estimate the diameter and number of teeth in the gear required. Find two meshing gears, on some operating machine, the pitch of which is the same as that required of the gear to be cast. Then cut a strip of thin brass to a width equal to the face, or thickness, of the gear required. Heat this strip to redness and feed it in between the two meshing gears of the selected pitch, turning the machine by hand. Thereby a strip of teeth of the proper size and shape will be produced. Fasten this strip, with brads, on the periphery of a disk of wood of the proper diameter and thickness. Fill the open space inside of each tooth outline with putty. Use the wood disk, thus modified, as a pattern. Coat it with lubricating oil and pour plaster of Paris around it to form a mold, as shown in the drawing. A smoother casting will be obtained from plaster than from sand. In this mold the gear blank is cast. The casting may be of a brass alloy where the service is relatively severe. Where little strain is imposed, or for experimental work, the blank may be cast of zinc or babbitt, both of which melt at low temperatures. —Arthur A. Richardson, Barnstead, New Hampshire.



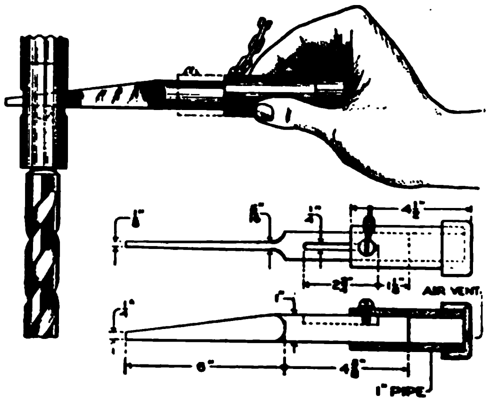
Pattern and Mold for Small Gear, and, at the Right, Small Gear Cast by This Method

Solder Paste for Difficult Fluxing

A paste, prepared as follows, will flux whatever it touches at once; will stick to cast iron, and work in out-of-the-way places. Take half-and-half bar solder, and reduce it to coarse filings. Figure this as 100 parts by weight. Add 10 per cent zinc chloride, in dry powder form, and three per cent powdered sulphate of copper. Wet this mixture with water and glycerin, sufficient to mix it thoroughly. Add about five per cent common vaseline to give it paste form. Apply in any way convenient. The paste will keep the soldering iron in good shape.—Robert C. Knox, St. Petersburg, Fla.

Drift Tool for Easy Removal of Taper-Shank Drills

One of the most aggravating of shop practices is the removal by the ordinary methods of a taper-shank drill that has become wedged in the socket of a drill press. Such drills may be readily removed, and with slight effort, with the aid of the homemade drift tool illustrated. The tapering wedge is made from a piece of shaft steel of the dimensions indicated. The pounding member is a length of pipe and a pipe cap, combined with the wedge part as shown. A length of chain secures the tool in a position always handy to the drill press. The wedge is inserted in



Taper-Shank Drills That Stick in the Drill-Press Socket are Quickly Removed by a Few Taps with This Drift Tool

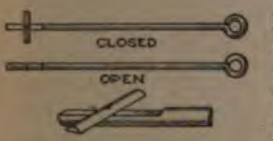
the slot at the base of the shank hole and one or two blows with the sliding handle is usually sufficient to dislodge the most stubborn drill.—C. S. Springer, Detroit, Mich.

Loosening Rusty Wood Screws

Wood screws that have become so badly rusted that they cannot be moved by ordinary means may be loosened by heating them. This may be done by applying a hot soldering iron or poker to their heads. The expansion and contraction caused by the application of the hot iron and its subsequent withdrawal will usually loosen them enough so they may be removed with a screwdriver.—J. C. Bailey, Whiteland, Ind.

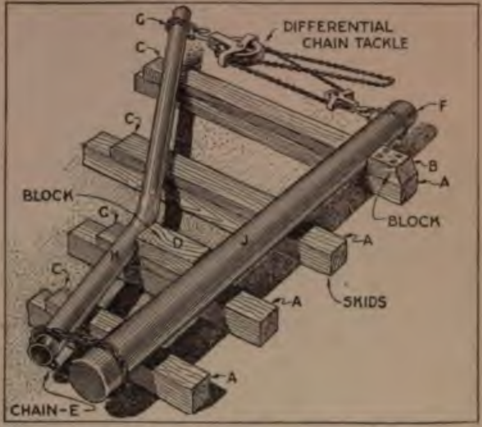
Rod for Holding Scissors Blades While Polishing

An improvement over the usual heavy-gauge wire for holding a number of shears and scissors blades while buffing is made is indicated in the sketch. A loop prevents the blades from sliding off one end. The opposite end is opened or closed as may be desired by a pivoted metal block. Such a rod is easily constructed. Two cuts with a hacksaw remove the piece that is to form the block. The parts are then drilled and riveted together loosely enough to permit the block to be turned.—Harry Seaman, Newark, New Jersey.



Apparatus of Simple Construction for Bending Heavy Pipe

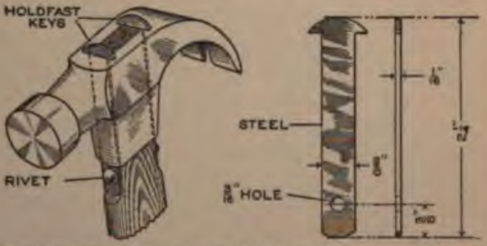
Heavy pipe can be straightened or bent to any angle with the aid of a few planks and a differential block and tackle. The skids A are distributed on a flat surface and the block B is spiked in place. If the pipe K, which is to be straightened, is 4 in., and the pipe J, 6 in. in diameter, the boards C should be an inch thick so as to bring the center line of the smaller pipe level with that of the larger one. This done, the members are chained together at one end, as shown at E, and the block D is inserted as a wedge. The differential is attached to chains at F and G where the greatest leverage is offered. When pipe of considerable size is handled, application of heat at the bending point is requisite.



Pipes of Large Size can be Bent to Desired Angles or Straightened Readily with Little Labor with This Outfit

A Hammer-Head Holdfast

To make this holdfast, which provides a positive method of preventing a hammer head from flying from its handle, cut out, with a hacksaw, from $\frac{1}{16}$-in. strap iron, two keys of the dimensions shown in the detail drawing.



By Fitting a Hammer with Keys, as Shown Here, There will Be No Danger of the Head Flying Off in Use

Drill a hole through the hammer handle and the keys in the position indi-

[illegible]

Portable Tool Chest and Workbench Is Easily Moved about the Shop

The Portable Tool Chest Permits the Workman to Carry His Tools and Vise to Any Part of the Plant in Which His Services are Needed

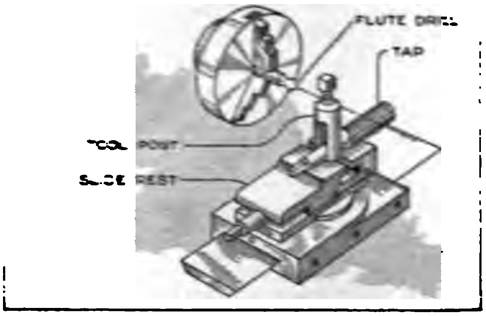
[illegible] spared much hard labor and the loss of valuable time by the use of a portable tool box similar to the one shown in the photograph. The chest illustrated was built for the use of a machinist whose work takes him from his lathe to every portion of a large manufacturing plant. Like most practical mechanics he prefers to use his own tools. The eight drawers of various sizes contain every tool of his requirement. Although the chest and its contents weigh several hundred pounds it may be moved about over the concrete floor with but little effort. The casters are large enough to pass over slight imperfections in the floor, while the roller bearings on which they are mounted reduce friction to a minimum. A vise mounted on one end of the chest saves many steps and a proportionate amount of time. All of the drawers may be locked by hasps that swing into latches at the bottom and lock above with padlocks. The locking arrangement for the upper tier of drawers is mounted on the back, where the hasp engages a set of protruding latches. For convenience in moving, steel handles are provided at both ends of the chest.

Solution for the Removal of Paint

Potassium cyanide dissolved in water is an excellent paint remover. The solution is applied to the painted surface with a brush or cloth, and allowed to stand for several hours. It may then be wiped off with a cloth, and the paint will come with it. If all the paint is not removed the first time a second application will usually accomplish the purpose.—H. W. Ol-[illegible], Grants Pass, Ore.

Method of Milling Flutes in Taps and Reamers

For work in which a special tap or reamer is needed and when no milling machine is available, the job may be done in an ordinary engine lathe, or even in a speed lathe, provided it is equipped with a slide rest. The upper sketch shows the appearance of the tap after being fluted in the lathe. The lower drawing shows how the tap is held in the tool post. A strong, flat drill, ground to the proper angle, is held in the chuck, as indicated. The tap must be set in such a manner that the center line is considerably below the center of the flat drill or cutter. To



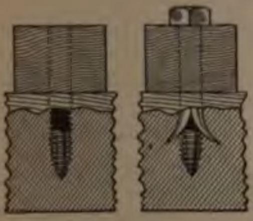
Taps and Reamers may be Fluted in Any Slide-Rest Lathe with a Flute Drill That is Readily Ground to Shape mill the tap, it is fed against the point of the cutter, as illustrated.—J. Limbrunner, Sheldon, Conn.

Tin-Coating Steel Lever and Wheel Handles

Grind or file the part to be coated. Immerse in muriatic acid for three to five minutes; then in a bath of pure tin for 20 to 25 seconds. Wipe the coated part, while hot, with soft flannel cloth so as to make the coating even. The tin should be heated so it will singe a piece of pine wood if inserted in it.

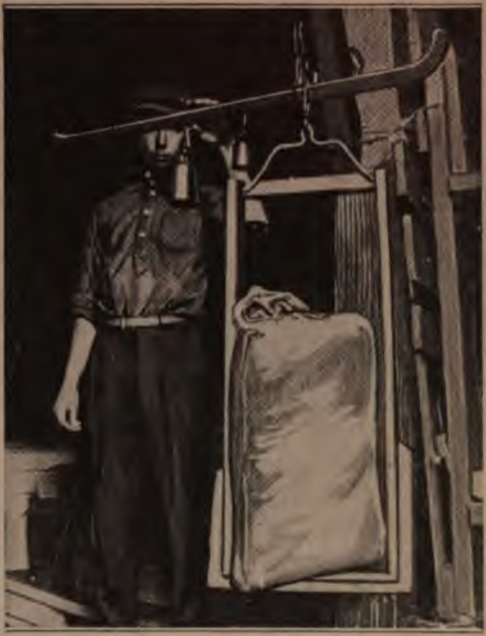
Setting a Lag Screw in a Hole Containing a Broken Point

When a lag screw breaks off in a hole and cannot be readily removed another screw may be set securely in the same hole by the method illustrated. The threads are dressed off the new screw with a file, and with a hacksaw the point is split a distance equal to the depth to which it would normally enter the wood. The points are then spread slightly and the screw driven home with a hammer. When the points of the new screw strike the broken piece they will spread out, taking a firm hold in the wood. Care should be used to cause the new screw points to spread with the grain of the wood to avoid splitting.—Walter H. Wolf, Londonville, Ohio.



Useful Platform for Weighing Sacks on Steelyard Scales

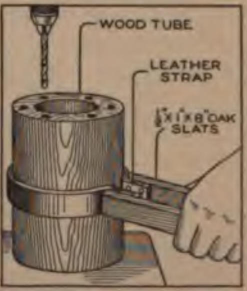
The utility of the old-fashioned steelyard scale can be increased by building a light platform on which sacks of grain and other articles that require a support can be swung from the steelyard. A strong platform, weighing about 12 lb., is made, and is easily carried from building to building as needed. A short piece of chain may be used to hang the steelyard from a rafter or a hook on the wall.—H. W. Stanley, Chicago, Ill.



Steelyard Scale Fitted with Platform, So That Sacks of Grain or Other Bulky Articles can be Weighed on It

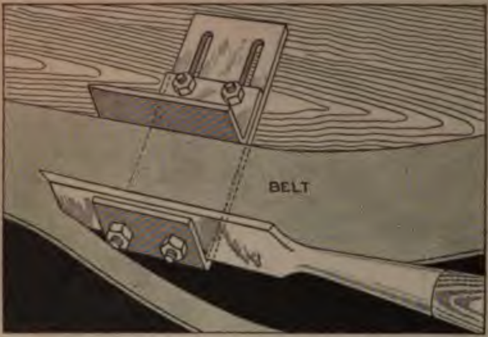
Handle for Holding Polished Round Stock for Drilling

In a large factory a rush order was received which called for countersinking several holes around the top edges of a large number of wooden cylinders. As the tubes were polished and varnished they were difficult to hold while drilling. This difficulty was overcome by the use of the simple gripping fixture illustrated. The strap is made just long enough to allow a little space between the handles when they are grasped firmly.



A Serviceable Homemade Tool for Trimming Belts

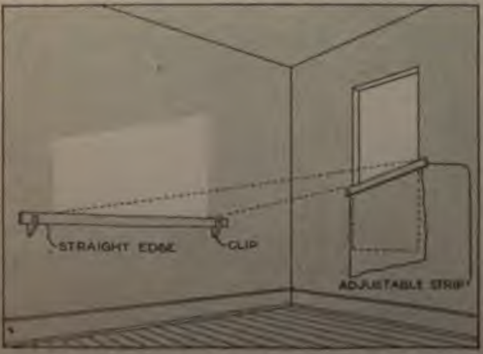
Many old belts may be trimmed down, or split, and made to give indefinite service on smaller machinery. An excellent tool for trimming such belting is made from an old chisel, as illustrated. Two holes are drilled through the blade and through these holes bolts are passed to fasten a piece of steel, bent at right angles and slotted as shown. A second piece of steel, bent at right angles, is bolted through these slots, and when tightened in place, serves as a guide for governing the depth of the split to be made.—Charles H. Wiley, Concord, N. H.



By Providing an Ordinary Wood Chisel with a Simple Metal Guide It may be Used as a Tool for Trimming Leather Belting and Similar Stock

Utilizing Sun's Rays for Truing a Straightedge

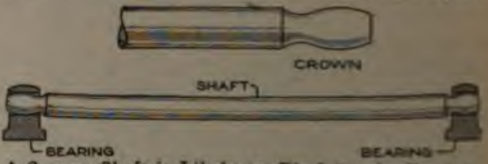
I had occasion to use a long straightedge, but no means for truing it was available. Finally, I thought of using the rays of the sun, shining through the window, to define a long straight line. Accordingly I mounted an adjustable strip on a window sash, as shown in the illustration, just so high that the rays over its edge cut along the top of the location where I mounted the straightedge. Thereby a long straight line was indicated and the straightedge was trued.—H. A. Trester, Milwaukee, Wis.



The Sun Shining through the Window at the Left Defined a Straight Line on the Side Wall, along Which the Straightedge was Trued

Making a Sprung Shaft Self-Alining

Because too much load was carried in the middle of some shafts, they sprung and bound in the bearings. By crowning the journals, a good bearing surface was had at any load. The spring of the shaft is indicated in the picture, and even with this amount of deflection, the shaft revolved freely. Of course, a shaft turning at high speed or under a heavy load could hardly be expected to give satisfaction under such conditions. In the case of the shaft illustrated the speed was but a few revolutions per minute.



A Sprung Shaft is Likely to Bind in the Bearings. If the Journals are Crowned as Shown, Little Trouble of This Kind will be Experienced with a Slow-Speed Shaft

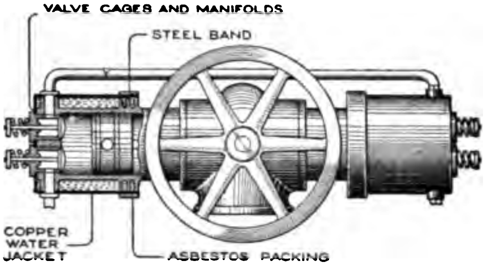
Reducing Waste in Breaking Tool Steel

As high-speed steel is very expensive and scarce, the following kink will be helpful in preventing waste. In most cases the machinist cuts off a length from the bar, and shapes the steel. Usually he grinds the bar on an emery wheel, and makes two cuts, one from each side, so the cross section of a cut is like an "X." This is wasteful. The right way is to make a single V-shaped cut from one side to the other.—Alfred Danyard, Detroit, Mich.

Water-Jacketing an Air-Cooled Motor

By E. E. STEVENSON

An air-cooled, two-cylinder, four-cycle automobile motor of conventional design was installed in a small speed boat. Its service was satisfactory except that it heated excessively after a half hour's operation. The heating was due to impaired air circulation. A water-cooling jacket, arranged as will be described, corrected the difficulty satisfactorily. All of the air flanges on each cylinder except the three nearest the flywheel were turned off in a lathe. Then these three, together with the inlet and exhaust-manifold bosses, were machined to a common true diameter, which was also the exact inside diameter of the sheet-copper water jackets which had been provided. Each jacket comprised a cylinder of sheet copper, 1/16 in. thick, with a disk of the same material brazed into one end. The spaces between the three remaining flanges on each cylinder were packed with asbestos cordage and red lead. Then the copper jackets were gently pressed onto the cylinders. Steel bands were shrunk on over them at the flywheel ends, clamping them snugly to the remaining flanges. Holes were cut in the jackets for the valve cages, and the intake and exhaust manifolds, and also for their respective tap bolts. These parts being securely clamped to the cylinders, water-tight joints were thereby provided between the cylinder walls and the copper water jackets. To circulate the cooling water, a geared pump, not shown in the illustration, was fitted to the end of the cam shaft. A supply pipe was arranged from the pump to each jacket and a discharge pipe was installed from each jacket through the side of the boat. Operation of the pump forced cool water through the jackets, thereby maintaining the cylinders at a reasonably low temperature.

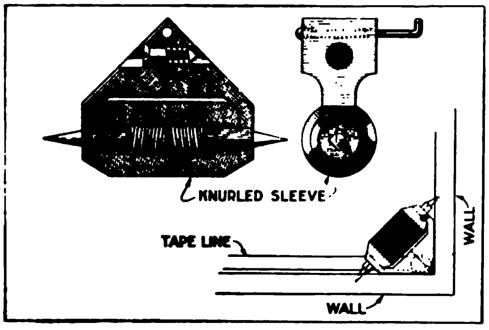


By Removing Some of the Flanges on the Cylinder of an Air-Cooled Motor, Fitting Sheet-Copper Water Jackets in Place of the Removed Flanges, as Shown, and Providing a Pump and Proper Connections, the Engine was Converted into a Water-Cooled One for Use in a Speed Boat

---

Tool for Holding Tape Lines in Corners

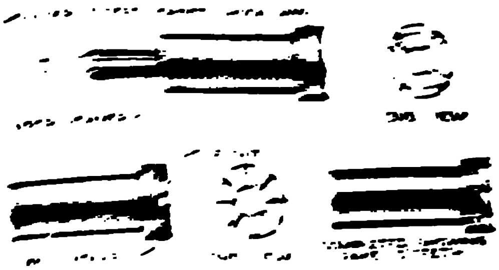
In measuring interiors unassisted, it is often difficult to hold the end of a tape line in a corner. This difficulty is quickly overcome with the fastening tool illustrated. The tool is made up from any grade of steel that is soft enough to be easily worked. It is provided with a hook for affixing the tape line to it. A knurled cylinder turns on an axle composed of two hardened steel pins, pointed at the ends and operating an interior two-way thread. The angle end of the tool is placed in the corner from which the measurements are to be taken. A turn or two on the knurled cylinder expands the pins, driving their points into the woodwork. The end of the tape line is then attached to the hook on the tool as in the sketch.—John R. Wiggins, Baltimore, Md.



This Tool may be Instantly Hooked in Any Corner to Provide a Fastening for Tape-Line Measurements

Hollow Mill for Making Wooden Knitting Needles and Dowel Pins

[illegible]



[illegible] Made from an Old Rifle Barrel [illegible] Pins and Other Objects from Light [illegible] in Centers in the Lathe

[illegible] and gives a good finish on [illegible]

[illegible] of an old 30-caliber rifle [illegible] a suitable material. Cut [illegible] of the barrel or other [illegible] Ream out all traces [illegible] Then face the piece in [illegible] a collar at one end. [illegible] the chuck. At this [illegible] a series of holes at [illegible] These holes [illegible] which are [illegible] the wall of [illegible] and the end [illegible] been formed a [illegible] the back. [illegible] the burr [illegible] made [illegible] and mild steel. The [illegible] teeth, gives a [illegible] makes them cut quicker [illegible] at the root of the teeth [illegible] the chips or cuttings.

This hollow mill can be used in a variety of ways. If the lathe has a hollow headstock, the mill is placed in the head and the wood is placed against [illegible] in the tool post. It is necessary, of course, to plane down the end of the stick so it can be fed into the mill. If the headstock is not hollow, the wood can be held in the chuck and the mill clamped on the tool post. The mill can even be clamped in a vise, and the wood secured in the jaws of a breast drill and turned rapidly.—E. E. Lo-[illegible], [illegible], Sask., Canada.

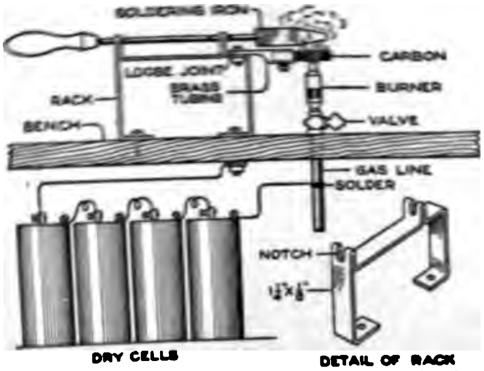
Softening Hard Iron and Brass Castings

Some iron castings to be machined were found to be glass-hard, and it was impossible to find tools that would stand up on them. We put a batch into a furnace until they were red-hot, and let them cool. Then they were machined with ease.

A similar treatment was adopted for brass castings for valve plugs. They were hard and brittle, and would break under slight pressure. We put the castings in a furnace and burned out the excess tin. Machining was easy after that.—R. Thomas, Cheyenne, Wyo.

A Self-Lighting Gas Soldering Torch

How a gas soldering-iron torch, which requires no matches for its lighting, can be made is described graphically in the illustration. When the carbon is swung over the top of the gas burner it contacts momentarily therewith, and when the circuit is broken, as the carbon is swung on around, a spark results. This, if the gas valve is open, ignites the gas. The carbon is connected electrically through the rack to one terminal of a battery of dry cells.

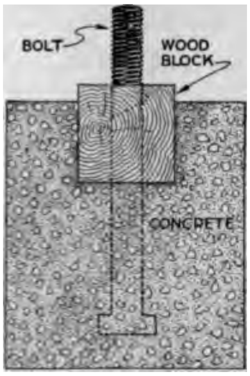


By Connecting a Battery of Dry Cells to the Torch as Shown and Swinging the Carbon Away from the Gas Burner, a Spark is Created, Igniting the Gas

The opposite terminal is grounded on the gas pipe. Although not always necessary, a spark coil connected in series with the batteries will increase the effectiveness of the arrangement. The carbon is supported in a piece of brass tubing which is flattened on one end to provide for the insertion of the screw on which this holder is pivoted. The rack, shown in detail in the drawing, is bent from 1¼ by ⅛-in. strap iron.

Alining Hold-Down Bolts in Concrete Foundations

When concrete bases are designed for machine foundations and column footings, hold-down bolts must be cast into the concrete. It is frequently difficult to place the bolts accurately enough to fit the foundations. If the holes in the foundations are not slotted to allow for slight inaccuracies in placing the bolts, the following simple expedient will be found practical.



Set the bolts into the concrete, and provide a drilled wooden block for each bolt, several inches thick and large enough to suit. The concrete is poured with the blocks so placed on the bolts as to make a shallow, narrow pit in the concrete. Remove the blocks before the concrete sets. The purpose of the pit is to permit the bolt to be bent slightly in any direction. In this way the bolts can be set to fit the holes in the machine foundation or column base. The pit made by the block is filled with concrete when the bolts have been fitted to the base. The block must not be left too long in the concrete, or the wood is apt to swell, making it difficult to remove.—S. B. Royal, Baltimore, Md.

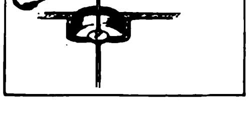
Flexible Scraper Makes Difficult Jobs Easy

Scraping corners is difficult where glue is used, as where the sides of a table are butted against the legs. The glue squeezes out, and there is danger of marring the wood and tearing out slivers when a common scraper is used.

A flexible scraper made of saw steel can be pressed flat against the work, while the hand has a good grip on the free end. It is impossible to cut deeper than the rolled edge, or to enter the joint. Use a piece of No. 26 gauge saw-blade steel, cut 2 in. wide by 6 in. long, which can be bought at any large hardware store. It can be cut with tinners' snips.

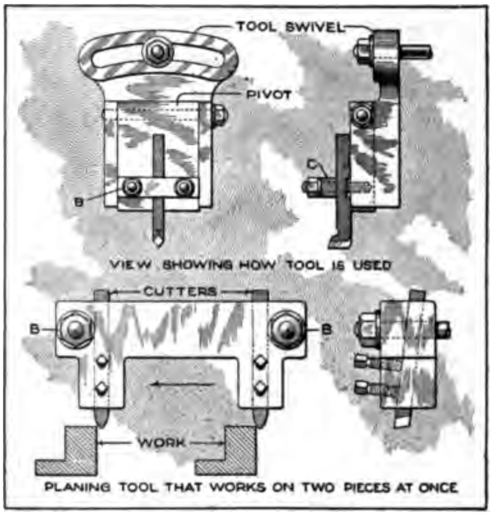
Useful Kink for Valve-Grinding Jobs

In case it is impossible to use a bit and brace to rotate the valve, motion may be given by a bow drill. Arrange a screwdriver with a pulley in the center, and a handle that will permit the shank to rotate. Make the bow by looping a piece of heavy iron wire. Then connect the ends of the bow with heavy cord, making a full turn on the pulley with the cord. This plan makes it possible to keep an even pressure on the valve and an even movement in both directions.



Planing Tool for Machining Two Parts at Once

It is often profitable, on work that will permit it, to plane two parts at once. This may be done very cheaply by equipping the planer as shown in the sketch. The tool holder is made by removing the strap C and the nuts B, which is followed by putting the tool holder containing the two cutters over the studs. These two tools now plane two parts in the usual manner by being fed across the work in the direction indicated by the arrow. Placing the tool holder over the studs in this manner does not interfere with the clapper-box feature of planing, as the tool holder is mounted directly on the pivot block, thereby permitting the tools to swing clear of the work on the return stroke.—J. Smith Higgins, Pawtucket, R. I.


TOOL SWIVEL
PIVOT
C
B
VIEW SHOWING HOW TOOL IS USED
CUTTERS
B
B
WORK
PLANING TOOL THAT WORKS ON TWO PIECES AT ONCE

Two Pieces of Work are Planed Simultaneously by the Use of This Simple Two-Cutter Planing Tool

---

Quick Methods of Converting Metric Measures

In working with metric measurements I have found the following methods practical in changing metric and other standards to their approximate equivalents in English standards.

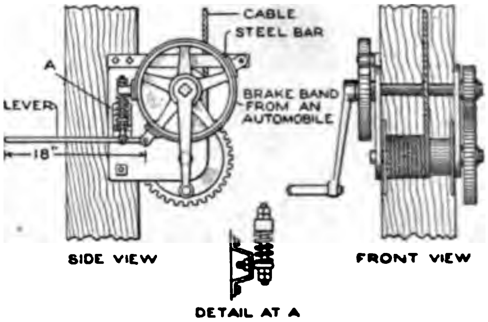
To bring centigrade degrees to Fahrenheit, double the figure, deduct 10 per cent, and add 32. Example: 30° C. doubled is 60; less 10 per cent is 54; adding 32, gives 86. Another example: 100° C. doubled is 200; less 10 per cent is 180; adding 32 is 212°, the boiling point in the Fahrenheit scale.

To bring millimeters to inches, accurately enough for general purposes, multiply each 100 millimeters by 4, drop off the required number of ciphers, and the result will be in inches. Example: 150 millimeters multiplied by 4 is 600; dropping the ciphers gives 6 in., which is approximately correct.

To bring meters to feet multiply by 3 and add 10 per cent. To bring kilograms to pounds multiply by 2 and add 10 per cent.—Victor A. Rettich, New York, N. Y.

Old Automobile Brake Adapted for Use on Windlass

The handle of a windlass that is unprovided with a brake is usually as treacherous as a bucking broncho when heavy loads are being lowered. Such a windlass may be made as docile as a kitten by fitting it with an old automobile brake as illustrated. The brake-control lever should be placed within convenient reach of the operator, so that once the load is lifted it may be locked in any position. If the loads to be lifted are sufficiently heavy to necessitate the use of both hands, a foot control on the brake will be found convenient.—Samuel J. Knox, Portland, Oregon.



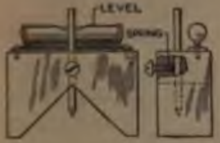
With the Brake, the Load Handled by the Windlass is Held Securely in Any Position

Swinging Door in Sliding Door Saves Employes' Time

Heavy sliding fire doors are extensively used as factory exits, and in fire walls. These doors are generally kept closed to eliminate drafts and economize heat. An employe must open these heavy doors in passing from department to department, thus wasting time. The remedy is to fit a small door in the sliding one. The small door is closed with a spring, easy to operate, and does not interfere with the automatic operation of the heavy sliding fire door.

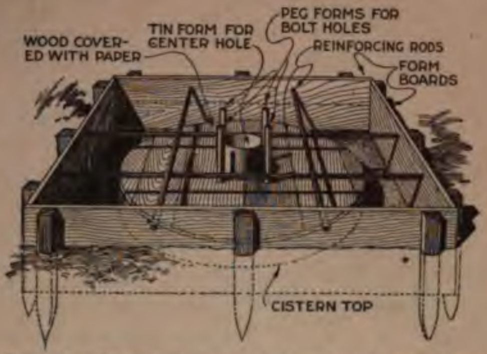
Tool for Laying Out Keyways

A tool useful for laying out keyways, or centers, on cylindrical pieces can be made by mounting a small level on a V-block, as shown, and adding a locating prick punch which extends through a hole drilled in the apex of the V-groove. The punch is not held rigidly by the screw, but is restrained by the friction of a spiral spring. With the tool level on the shaft, a tap with a hammer on the punch will form a prick hole at the vertical position in the shaft. To verify the accuracy of the tool, it may be reversed and another prick mark made, which can be compared with the first.—J. H. Rouse, San Francisco, Calif.



Reinforced-Concrete Cistern Cap

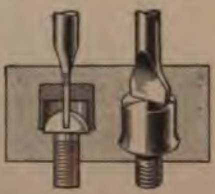
A cap for a cistern can be made easily of reinforced concrete, as will be described. A cover of this material has the advantage that it will withstand the effects of the elements indefinitely and that it will not foul the water. The procedure is this: Fit planks over the opening of the cistern. Then lay a sheet of heavy paper over these boards. This prevents the concrete from sticking to the wall or leaking through the cracks. Arrange the form boards, which should be 4 or 5 in. high around the outside, as shown in the drawing, and support them in position with stakes. Then bend a strip of sheet iron into a hollow cylinder of sufficient diameter to admit the pump cylinder. Set this form in the center to provide an opening for the pump. Place heavy iron rods for reinforcing, in the form, as shown, and fill the form with concrete. Before the concrete has set push into it vertically, down to the wooden cover, four cylindrical sticks of wood. These should be located to correspond with the bolt holes in the pump base. After the concrete has set remove the form boards and bore out the cylindrical wooden rods.—Stanley Dougan, Pawnee, Okla.



Form for Casting Reinforced-Concrete Cap over the Top of the Cistern on Which It is to be Used

Self-Centering Nonslipping Screwdriver Head

If the point of a screwdriver which is used for driving screws of only one diameter is fitted with a bell, as shown in the sketch, the slipping of the edge of the driver from the slot will be prevented. Furthermore, the bell automatically centers the blade in the slot, promoting rapid work. The bell may be formed from sheet metal, but for continuous use one turned from bar stock will prove more economical. —P. J. Backus, Delphos, Ohio.

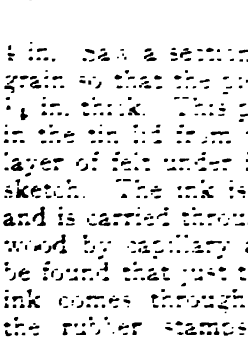


Handy Rubber-Stamp Ink Pad for the Shop Office

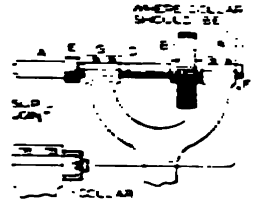
A block of wood forms the major portion of an ink pad that will not permit a large quantity of ink to adhere to the rubber stamp, thus insuring an even, unblurred reproduction. Secure a block of some soft wood, the cross section of which is 2 by 4 in. Saw a section of this across the grain so that the piece secured will be 1/4 in. thick. This piece is then placed in the tin lid from a cocoa can with a layer of felt under it, as shown in the sketch. The ink is placed in the felt and is carried through the grain of the wood by capillary attraction. It will be found that just the right amount of ink comes through the wood to ink the rubber stamps properly.

Band Saw Cuts Out Paper Labels of Irregular Outline

A printer who produces many labels of irregular outline employs a band saw for cutting out a thousand of them simultaneously. Thereby the cost of and the delay in obtaining a die is obviated. This is a decided improvement over the method of cutting a few at a time. Here is the procedure: Assume that a consignment of approximately round labels is to be produced. Print all of the labels on square pieces of paper of uniform size. Cut two blocks of soft wood, as illustrated, of the same size as the labels. Place one wooden block at the bottom and the other on the top of the pile. Pad the blocks and the labels together with strong glue. Paste on the top block one printed label which will serve as a guide when cutting. Now cut with a fine band saw around the outline of the label. About one thousand may be cut with the saw at one time. Heart-shaped, octagonal, or any other irregular contours can be cut as readily as can the approximately round label reproduced in the illustration. With a suitable saw the finished product is perfect and the cost is very low.



Collar for Flue-Cutter Slip-Joint Shaft



It was necessary to provide a collar on a flue-cutter shaft to prevent longitudinal movement of the shaft, because without the collar the shaft would work over so far that the belt slipped from the pulley B. The machine could not be taken apart to place a set collar at D where it should, under ordinary conditions, be located. A clamp collar might have been used, but this would involve the installation of a guard for it. When the shoulder E was close to the box G there was not enough shaft exposed at F to accommodate a set collar. The small detail at the left shows how the problem was solved. A cap of 2-in. outside diameter was made. It was counterbored 3/8 in. to fit over the shaft and was held in place by a screw turning into a tapped hole in the end of the shaft, as shown. This screw has a round head to prevent its catching on objects and is pinned to prevent it from turning out. Thus an effective "end collar" was provided. — A. G. Corssen, Centralia, Ill.

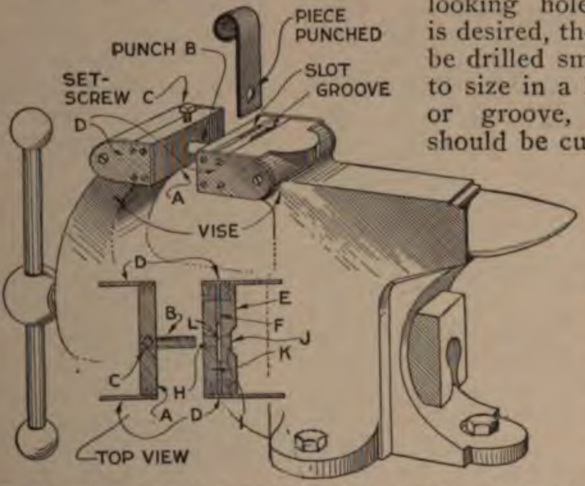
¶To learn sign and show-card painting, one of the best books to get is a type catalog.

Making a Punch-and-Die Attachment for a Bench Vise

By L. A. Crozier

An ordinary bench vise may often do the work of a punch press costing several hundred dollars, if rigged up as shown in the illustration. Of course, the speed of operation will be much slower, and it will be difficult to secure any great accuracy, but these are often not of much importance when only a small number of parts are to be made — say from 20 up to 1,000.

The method of construction described here can, of course, be varied to suit different conditions; the size of hole that can be punched depends on the size of the vise, and on the thickness and hardness of the material. In the case here described, a ⅜-in. hole was to be punched in a number of phosphor-bronze lugs. A punch, B, made of ⅜-in. drill rod, hardened at the cutting end, was fitted into a piece of ½-in. flat, mild steel, A, shaped to cover the movable jaw, and a setscrew, C, was placed so as to keep it from working loose. The soft end of the punch should seat firmly against the vise jaw. The punch holder A was made fast to the vise jaw by two thin pieces, D, with small machine screws. This completes the punch, or moving member. The fixed member, or die, is similarly fastened to the stationary jaw of the vise. It consists of the die block E, the stripper K, the plate F, and the two thin pieces D, fastened together with screws as shown. The die block should be made of tool steel, at least ½ in. thick, and should be drilled out the size of the punch; or if a cleaner-looking hole in the work is desired, the die block may be drilled small and reamed to size in a lathe. A notch or groove, shown at J, should be cut, large enough to permit the punching to drop out. The hole in the die block should be enlarged slightly, up to about ¼ in. from the cutting surface L, as indicated at H; this may be done with a larger drill or with a taper reamer.



By Mounting a Simple Punch and Die in the Jaws of a Bench Vise, It may be Made to Do the Work of a Punch Press

The stripper for such a die should be made quite thick, this one being made of the same thickness as the punch holder; it should be drilled and countersunk as shown, or reamed with a taper reamer, depending on the amount of "wobble" in the vise, so as to guide the punch accurately into the die and prevent shearing the punch.

The plate F is a little thicker than the work to be punched, and is shaped so as to locate it properly.

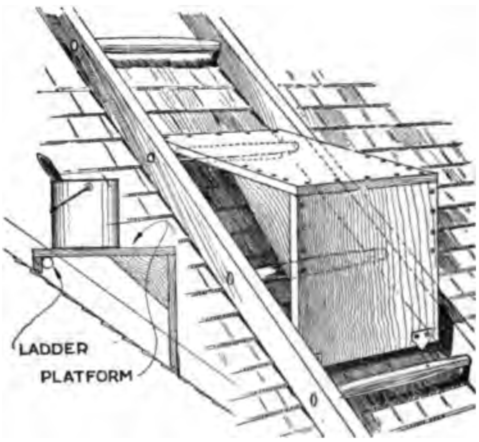
A good way to match the punch with

the die hole is to complete the punch first, and assemble the parts of the die before the hole is drilled in the die block and stripper. With the two members mounted in the vise, the punch can be screwed up against the stripper and a mark scribed around it to locate the hole, which may then be drilled clear through the die. The die block should of course be hardened before use.

Various types of simple dies for use in vise jaws will suggest themselves when required.

Convenient Ladder Bucket Jack for Roof Workers

An ingenious painter has built this jack or shelf to hold his paint bucket



A Bucket Jack for Roof Painting, Which can be Quickly Moved as the Work Progresses

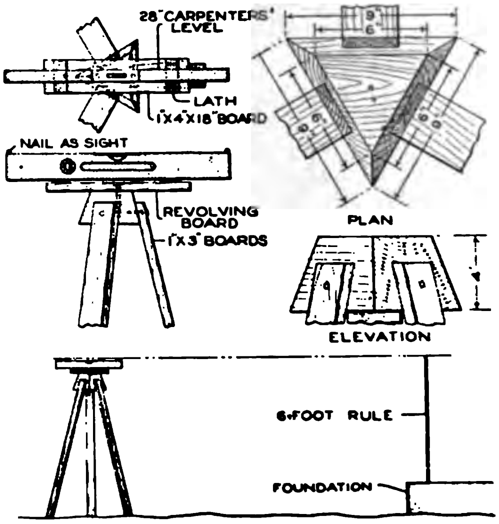
while at work on a roof. The construction is shown clearly in the sketch. The upper end hangs over a rung of the ladder, while the lower end has two steel plates with sharp points which take hold in the shingles; the points may be left off if the corner braces are firmly fastened with screws. The rack can be moved from one rung to another in a second or two.—T. B. Paul, Dermott, Ark.

Burrs inside Tubing and Castings Removed by File in Chuck

Tubing and metal castings having an inside surface frequently require burring. The burrs on the inside surface, caused by drilling holes from the outside or from milling operations, are often difficult to remove by hand. In the burring department of a large factory it is the practice to insert a rat-tail file in the chuck of a lathe. This permits the revolving of the file at high speed, and if the product to be burred is held so that the file operates against the inside surface, the burr is quickly and neatly removed.

Surveyor's Tripod Level Made Quickly from Carpenter's Level

A good substitute for an architect's or surveyor's level for general purposes, such as leveling house foundations, building roadways, and similar work not requiring minute accuracy, is shown in the sketch. It consists of an ordinary carpenter's level placed upon a simple tripod. A small finishing nail on each end of the level is convenient in sighting. The method of leveling is, of course, the same as that employed when using the surveyor's level.—Roy H. Poston, Flat River, Mo.

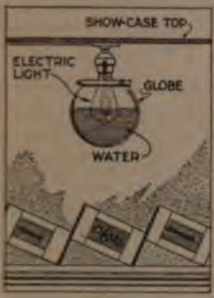


Sufficiently Accurate Results for Ordinary Work may be Obtained Up to a Distance of 500 Feet on a Clear Day with This Homemade Level

A Simple Depth Gauge for Blind Holes in Wood

When a number of holes are to be drilled in wood, of the same depth, and no collar is handy to make into a depth gauge, a cork may be used. A hole is drilled through it somewhat smaller than the drill, and it is forced on. It has been found that as many as 100 holes can be drilled to an accurate depth without readjusting the cork.—H. S. Hart, Shreveport, La.

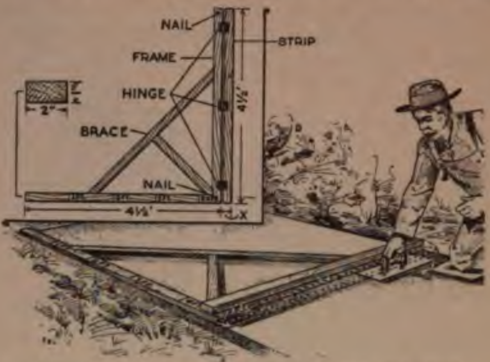
An Electric Cigar-Case Humidifier



A proper degree of humidity may be maintained in a cigar-display case and the case illuminated, at the same time, by arranging an incandescent lamp so that its lower end dips in water contained in a glass fixture bowl. The globe is supported from the lamp socket by an ordinary shade holder. When the lamp is lighted, the heat developed vaporizes the water, which keeps the cigars moist.

Folding Square for Dividing Concrete Sidewalks

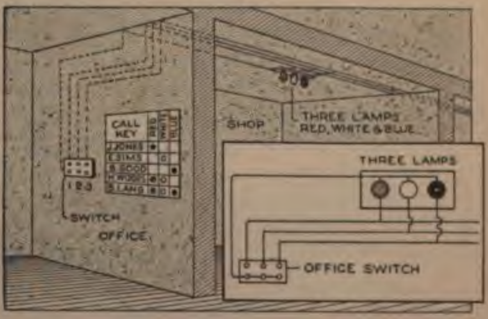
The sketch shows a square for rapidly cutting cement sidewalks into blocks, 4 ft. long, or any other dimension. It is designed as an improvement on the method of pencil marks made on the forms, which are obscured by the concrete and are seen with difficulty. The frame may be made of 1 by 2-in. material and each arm should be about 4½ ft. long. Drive nails through as indicated, projecting about ¼ in. to prevent slipping of the square. The strip at the right swings on hinges. The distance X should be the same as the distance from one edge to the center of the sidewalk center tool, which varies from 1¼ to 1⁷⁄₁₆ in. As soon as the block is cut at the edge of the strip, the strip is turned back, and the sidewalk center tool run across the block, keeping one edge of the tool against the frame. The square has been found to be convenient and rapid.—J. W. Muncey, Jesup, Iowa.



The Folding Square Divides Cement Sidewalks into Even Squares That Are Accurate

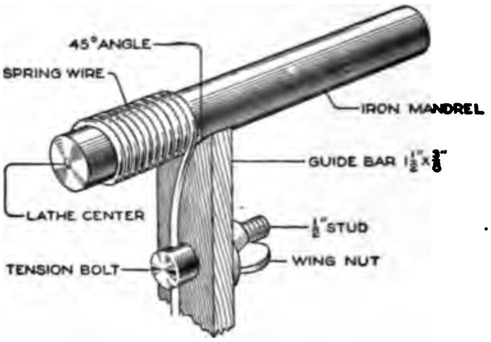
Colored-Light Electrical Shop-Call System

A visual call system for an office, shop, store, or other institution, which will make it unnecessary to send a messenger about the plant to locate an individual who is wanted in the office, can be arranged as indicated in the illustration. Where such a system is used, a combination of lights can be assigned as a signal to each person who is frequently called. The switches operate similar lights in every department, so that wherever the man called happens to be, he will see his signal, and will call the office on the nearest telephone.



Schematic Representation, with Wiring Diagram, of a Colored-Light Electric Shop-Call System

Device for Winding Spiral Springs on a Lathe

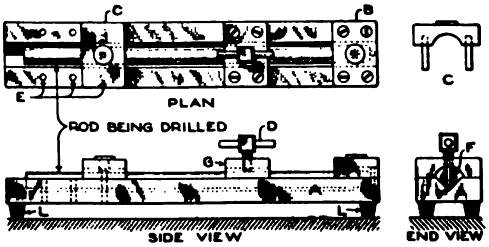


The Guide Bar, by Holding the Wire at a Constant Tension, Insures the Uniformity of the Spring. For Open Springs, the Feed Is from the Lead Screw

Spiral springs may be quickly wound on an ordinary lathe with the aid of the simple device illustrated. The spring wire is wound on the mandrel, which should preferably be set between the centers of a lathe. The wire is fed through a tension bolt held in a guide bar, which is supported and fed longitudinally along the mandrel in the tool post of the lathe, as the mandrel is rotated. When winding a closed coil spring, it is unnecessary to set the guide bar in the tool post, inasmuch as it can be fed along by hand with good results.—J. J. Booth, St. Louis, Missouri.

A Jig for Holding a Round Rod to be Drilled

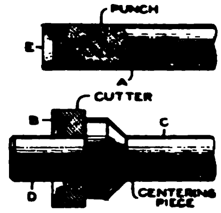
Holes in small round rods may be drilled accurately and quickly at the locations required by using the jig shown in the drawing. A bar, A, of machine steel, in which a V-groove has been planed, constitutes the body. One block, B, equipped with a drill-hole bushing may be attached with screws at the location where one hole is to be drilled. Another block, C, also equipped with a drill-hole bushing, is adjustable. Guide pins on its under face engage in the holes E in the bar. These holes are so located that the holes in the rods will be drilled where required. The block G is fastened with screws. It is drilled and tapped for a setscrew, D, which clamps the rod tightly, thus preventing it from turning. The stop pin F locates the rod accurately in the groove. Lugs, L, attached to the bottom of the bar, permit the fingers to pass under it so that it can be adjusted readily on the table of the drill press.—E. S. Goodell, Chicago, Ill.



With This Jig Small Round Rods can be Drilled Quickly and Accurately. It is Easily Adjusted on the Table of a Drill Press

Tool for Cutting Thin Brass Washers

A number of washers were formed from sheet-brass stock, .005 in. thick, with the tools detailed in the accompanying drawing. The number of washers required was not sufficient to justify the expense of a punch and die for use in a press. Hence, the tools were designed so that the cutting could be done with a hand-hammer blow. Tool-steel stock of a diameter equal to that of the hole to be punched in the washer was used for the punch A. It was cupped at the bottom, as indicated at E, thus providing a cutting edge. The cutter B was also made of tool steel turned with an outside diameter equal to that of the washer, and cupped as shown. The working ends of both the punch and the cutter were tempered to cut brass. A centering piece, C, was turned from machine steel. Its lower end, D, was made of the same diameter as that of the punch, so that it formed a pilot pin centering the cutter over the hole previously cut in the washer blank. A



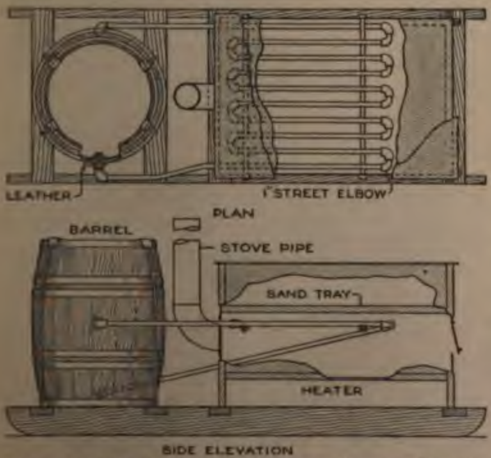
shoulder turned on the centering piece holds the cutter in correct relation. Washers formed with this tool become concave. Hence, to flatten them, each was laid between two iron blocks and the upper one was given a sharp rap with a heavy hammer.

Cleaning a Clock Quickly and Thoroughly

Clocks that need no repairs may often be cleaned without taking the works apart. Remove the works from the case, and take out the verge and flies. Then, with the wheels in rapid motion, pour naphtha or gasoline over the works, or immerse them in a dish of gasoline. Finish by wiping dry with a linen rag, and oiling with best clock oil. This method is especially good for clocks that have been treated with kerosene, as the gasoline quickly removes the gummy kerosene residue, which has often accumulated to a surprising degree.—William C. Strong, Natick, Mass.

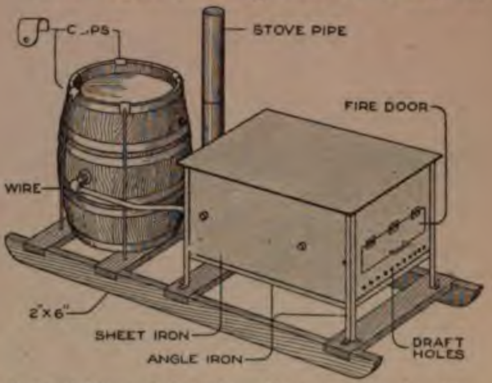
Portable Water-Heater Outfit Made from a Barrel

This device warms gravel and sand as well as water, for winter construction work, with one fire. The use of standard parts and material makes the heater easy to construct. The sketches indicate the construction and assembly details. Stout skids give the heater a firm base and make moving easy.



Plan and Side Elevation of Heater, Showing Details of Water Circulation

The water-heating coil is made of 1-in. pipe and street elbows, as indicated. By tapping the barrel at two levels the circulation of water through the heating coil is assured. The barrel is held firmly in place by means of clips over the rim, fastened by heavy wire or light rods passing through the skid crosspieces. The coils are held over the fire by two pieces of pipe, crossing the fire and supported by the sides of the heater.



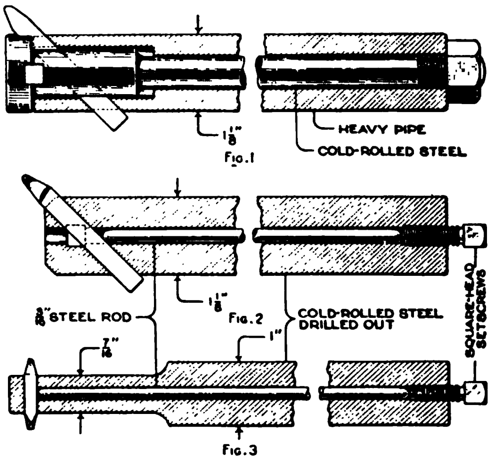
General View of Complete Heater Ready for Use: It will Burn Any Refuse Wood as Fuel

Easy Method of Removing a Boiler Flue

When removing a defective flue from a boiler, it is often necessary to transfer it; that is, it must be taken out through a flue hole other than its own, being prevented by some obstruction from being taken out through the latter. To accomplish this, after removing the flue occupying the hole through which the defective one is to be removed, the defective flue is pulled out through its own hole about a foot, and the extending portion is cut off with a pipe cutter or hacksaw. The remaining length is then pushed back into the boiler, and can easily be shifted over so as to be pulled out of the hole desired. If other flues intervene, they should first be removed by the same process.—W. H. Thomas, Davenport, Iowa.

Methods of Holding Tools in Lathe Boring Bars

There are many styles of boring bars in use, but those shown in the illustration offer the advantage that the tools are firmly held by a screw, or nut, which is far from the work and cannot get in the way. Figs. 1 and 2 show types which are suitable for boring out holes 1¼ in. in diameter, or over, while Fig. 3 shows a bar for smaller diameters. In the first two, holes are provided for holding the tool at either 45° or 90°; other angles may be used if desired. The bar shown in Fig. 2 may readily be made double-ended, holes being then drilled for tools in both ends; that shown in Fig. 1, however, clamps the tools with somewhat greater force. The bars are best held in a rigid holder built onto the tool post, but they may be readily adapted for swinging between centers if desired.—M. L. Lowrey, Livermore, Calif.



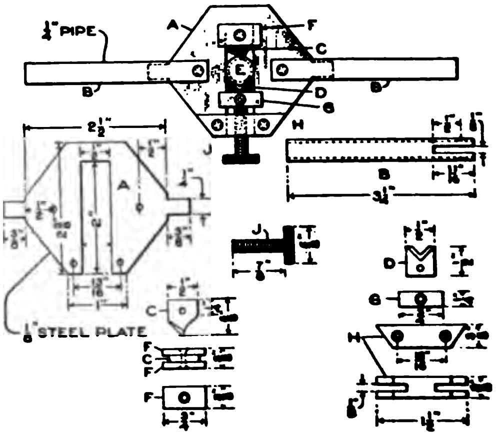
The Tool is Clamped in the Bar So That No Screw or Sleeve can Get in the Way

Handy Chemical for Use about the Automobile

Carbon tetrachloride, a colorless, volatile chemical, is handy for use about the automobile. As a liquid fire extinguisher, it has no peer. Used as a solvent for unvulcanized rubber, it makes an excellent cement for inner tubes. It dries quickly, has no disagreeable odor, and is not inflammable. It can also be used to make cement for repairing mohair tops, and is an excellent solvent for removing grease and oil from clothing, leaving no "ring" around the cleaned spot. For marred mud guards, make a solution of Egyptian asphaltum, or gilsonite, in the carbon tetrachloride and apply with a brush.—Leon A. Haloin, Denver, Colo.

A Serviceable Tool for Cleaning Threads on Bolts

The tool here illustrated, which looks like a tap wrench and works somewhat like a die, can be made entirely on the bench. The construction is evident from the drawing. The cutter C should be kept fairly sharp; it should, of course, be ground to a 60° "V," to fit the thread. The V-block D should also be beveled down to fit the thread; its edges should not be exactly opposite the cutter point, but offset about half the pitch of the average thread; for instance, if most of the bolts to be cleaned are from 12 to 20 pitch, the beveled edge of D should be set back 1/32 in., so that a 16-pitch bolt will be held exactly at right angles to the plate A. Bolts up to ½ in. in diameter can be cleaned up, and any small defects in the thread cleared out.—C. Ray Haynes, Center Village, N.Y.



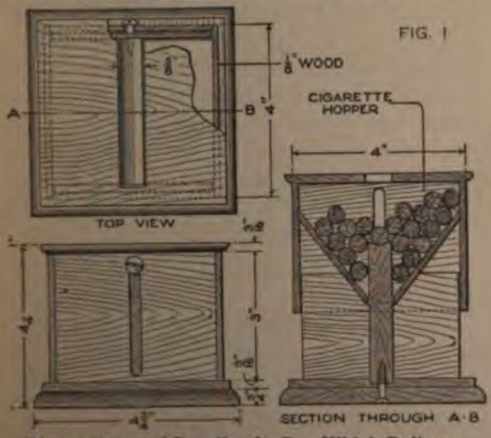
DETAIL OF TOOL PARTS

The Thread Cleaner Is Adjustable So That It can be Used for Various Sizes of Bolts

Cigarette Box Deals Out One at a Time

WHEN the cover or top is raised this cigarette box delivers one cigarette each time the process is repeated.

A wood base is fashioned of hard wood, in the manner shown in section in Fig. 1, 4½ in. square, to which is fastened an upright with a grooved top, large enough to hold a cigarette. The base is cut out ⅛ in. in depth to admit the upright, which is screwed fast from the bottom, as in the sectional view. Two sidepieces, of ⅛-in. material, are nailed to the sides of the upright to make it firm, and also to act as a slide for the cover, as shown in Fig. 2. The top, or outside box, is also made of ⅛-in. material. The sides are cut so as to fit loosely over the two sidepieces of the upright. In the top a slot is cut, ⅝ in. wide and the length of the top, to admit the upright. The sides and top of the cover together are 3³⁄₁₆ in. in height, so that the upright is flush with the top. Two pieces of ⅛-in. stuff are cut 3 in. wide and as long as the inside of the cover, and glued to it, as shown, forming a triangular hopper for the cigarettes. Sufficient space at either end is allowed for the cover to be let down over the lower part until it rests on the base. A small slot is also cut in each end of the cover, as shown. The cover is then put into place, and a small round-head screw put into the upright on either side, through the slot at the top, to prevent the top from coming off when it is raised. The box is then polished or shellacked, and a piece of felt glued to the underside of the base to prevent it from scratching. The filling is accomplished by raising the cover and putting the cigarettes into the hopper through the opening in the top. The box will contain about 40 cigarettes when filled. The sectional view in Fig. 1 clearly shows what happens when the cover is raised and lowered.



Dimensions and Details of a Box Which Delivers One Cigarette Every Time the Cover is Raised and Lowered

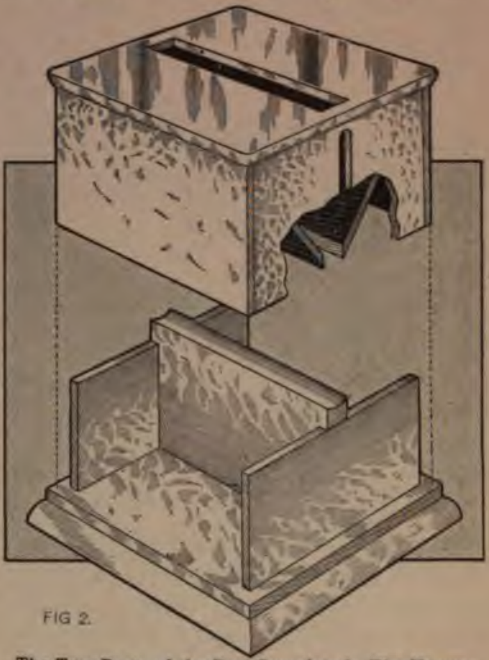


FIG 2.

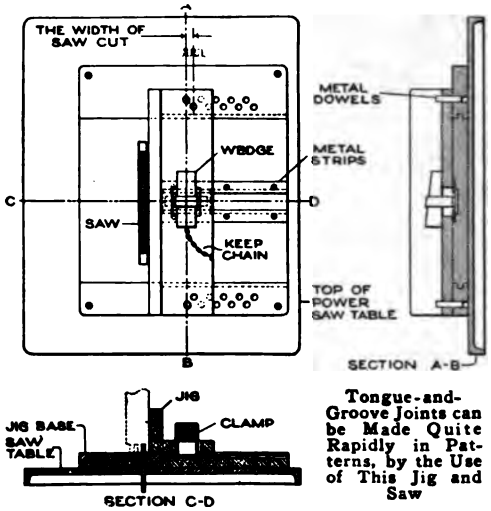
The Two Parts of the Box Completed: The Hopper under the Top Has Space for About 40 Cigarettes

Filling Cracks in Concrete with Putty

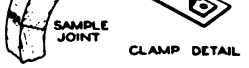
To repair temporarily cracks in concrete work around brick flues on houses, where they project from the roof, putty has been used with good results. The putty for this work should be mixed until it is thoroughly elastic, but not thin, and then worked well into the crevices.—H. K. Capps, Stahl, Mo.

Segment-Joining Jig for the Home Workshop

In the accompanying diagrams are described graphically the construction and operation of a segment-joining jig, which was developed in a campaign to increase pattern-shop efficiency. Thin flanges and loose rings are always troublesome to construct, largely because of the difficulty in joining the segments effectively. When made by almost any of the commonly used methods, their cost is excessive. But with the arrangement shown, any circular saw may be equipped to cut economically tongue-and-groove joints. The construction and operation of the contrivance will be obvious from a study of the illustrations. Each slot is cut with the jig held in one position by the dowels. Then for the next slot the jig is moved ahead one dowel hole before the saw cut is made.—D. D. Gurnee, Hempstead, N. Y.



Tongue-and-Groove Joints can be Made Quite Rapidly in Patterns, by the Use of This Jig and Saw



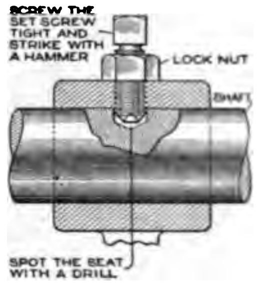
¶Good, tough rivets for use in fiber or pasteboard can be made from wire solder.

How to Make Wax for a Dance Floor

To make powdered wax for a dance floor, melt, in 66-deg. benzine, as much wax (paraffin will do) as the liquid will take up, then stir in some talcum powder to form a fairly stiff paste. Rub this through a No. 1 sieve and spread out thinly on trays, to permit evaporation of the benzine. Be careful about fire. When the mass has become perfectly dry, pulverize it and place in tin cans with perforated tops; use by sifting it on the floor.

Overcoming Setscrew Loosening

Cup-ended setscrews, which are used for holding collars, flywheels, gears, keys, etc., in place on shafting, frequently loosen and cause trouble, unless the setscrews are properly fitted. The best method of fitting such screws is to spot-drill the seat, and screw the setscrew in place firmly, then strike the head of the setscrew sharply several times. The final tightening gives the cup face a firm seating on the shaft, and it is not likely to loosen. A hexagonal nut will give additional security if placed on the setscrew and tightened after the setscrew has been upset with the hammer. This will lock the piece against loosening, even though there is excessive vibration.—Geo. A. Luers, Washington, D. C.


SCREW THE SET SCREW TIGHT AND STRIKE WITH A HAMMER
LOCK NUT
SHAFT
SPOT THE SEAT WITH A DRILL

Simple Method of Saving on Typewriter Ribbons

Users of small portable typewriters will obtain double service from the same investment in ribbons if, instead of buying the ribbon regularly supplied for the machine, they will vide themselves with a 20-yd.

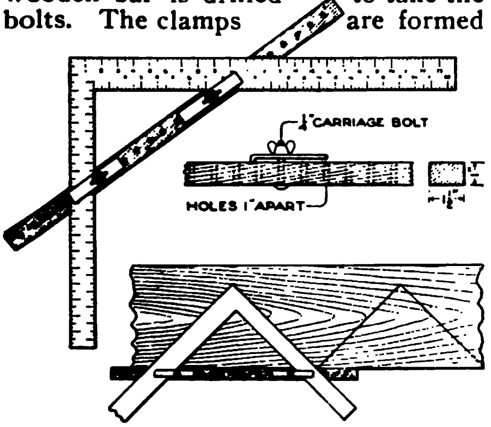
of the same width, such as are used on most office typewriters. Ribbons of the portable typewriter are usually 10 yd. in length. For such a ribbon one pays 75 cents or $1, the same as for the longer ribbon that is used on office machines.

By buying the 20-yd. ribbon and cutting it in two, one has two ribbons for the little machine at the same price ordinarily paid for one. If the portable typewriter is provided with a two-color adjustment and one is able to get along with one color, the service of four ordinary ribbons may be obtained from the one 20-yd. ribbon. After being cut to form two ribbons, each ribbon is used on both edges by manipulating the two-color shifting adjustment.—John Edwin Hogg, Alhambra, Calif.

Handy Square Attachment for Laying Out Stairs

After the riser and tread have been decided, this device is handy in scribing the stair stringers. It consists of a carpenter's square, and a wooden bar with clamps which hold the bar and square snugly together. When set, there can be no slipping, and thus all marks are regular and the finished job uniform.

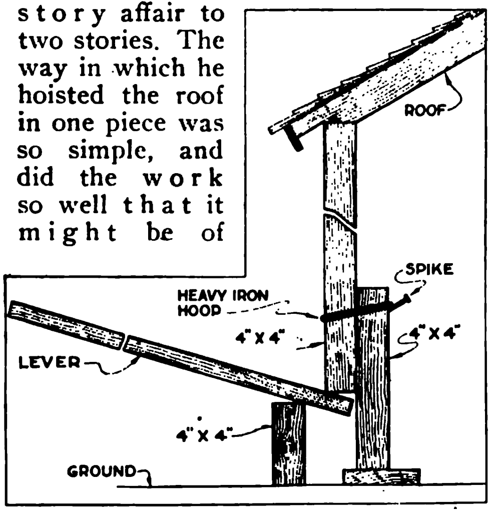
The illustration shows how the wooden bar is drilled to take the bolts. The clamps are formed of strips of 3/16 by 1¼-in. steel.—C. C. Spreen, Flint, Michigan.



With This Device Attached to an Ordinary Carpenter's Square, the Laying Out of Steps is Made Easy

Novel Method for Lifting Large Objects

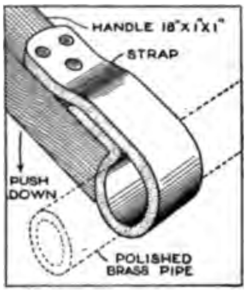
A short time ago a neighbor undertook to enlarge a barn from a one-story affair to two stories. The way in which he hoisted the roof in one piece was so simple, and did the work so well that it might be of value to others. The roof was severed from the sides, resting upon temporary supports, and several boards were removed from the sides. Then six or eight hoops were made at the blacksmith shop, a little over 4 by 8 in., inside dimensions. These being made ready, a number of timbers, 4 by 4 in. in size, were secured and arranged as shown. One was set in the wall where a board had been removed, to help support the roof. A shorter one was placed against the first, and the hoop slipped over both. A spike was driven into the shorter one to support the hoop. All the timbers and hoops were arranged in this manner, and when ready, it was but a simple matter to go around from one to the next, lifting each one a little in its turn.



The Entire Roof of the Barn was Raised by Prying Up Each of the 4 by 4-Inch Timbers a Little at a Time. The Iron Hoops Kept Them from Slipping Back

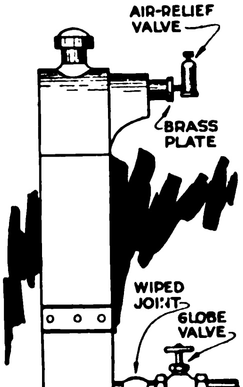
The action of the hoop is obvious. As the roof is raised, the hoop allows a movement of the timber up, but when released, automatically clamps and holds it against an opposite movement. The whole cost for material was $4, and the roof was raised in an hour.—Dale R. Van Horn, North Loup, Neb.

Wrench for Small Polished Pipes



A sure-grip wrench which can be used on highly polished nickel or brass pipe, without marring or crushing the tube, may be made in the following manner: Nail to one end of an 18 by 1 by 1-in. hardwood stick a strong leather, or canvas, strap of suitable length, as shown. Rub powdered rosin on the strap. Wrap it around the pipe in the manner shown. Use the wooden-stick lever as a handle. To turn the pipe in the opposite direction, reverse the tool.—Walter B. Raynor, Patchogue, N. Y.

Automobile Radiator as a Heating Unit

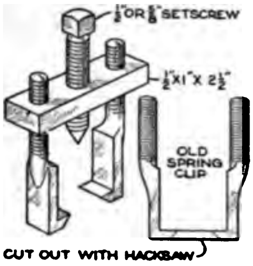


Having need of an additional steam radiator for one side of his show window, the depth of which was very scant, an automobile repair man solved the problem of fitting the additional heater by making use of a discarded automobile radiator, instead of the regular cast-iron or pipe kind.

For the purpose, a brass flange, to take the 1½-in. steam-pipe union, was wiped on the lower, or outlet, pipe of the radiator. The upper, or inlet, pipe was permanently closed with a brass plate soldered in place, making a tight fit. The plate was drilled and tapped with a in. pipe tap, to receive the air-relief valve. A copper-asbestos gasket was fitted to the filler cap, which was screwed down hard in place. The precaution had been taken, of course, to solder up the small overflow pipe.

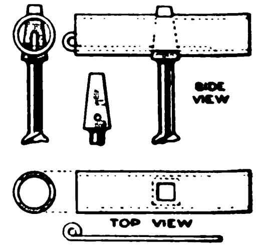
Gear Puller Cheaply Made from an Old Metal Screw Clip

This is a handy tool for emergencies. The difficulty of removing gears from their shafts is familiar to all motorists.



This device has the merit of simplicity, cheapness, and compactness. An old spring clip is sawed apart, and two claws for gripping the gear are finished with a file. A steel bar is then drilled and tapped in three places, as shown. Into the center hole is screwed a pointed setscrew. The two claws are set on the gear hub or rim. The depth may be varied to meet the circumstances. By turning the pointed setscrew with a wrench, the claws start the gear or pinion, and pull it from the shaft smoothly and surely, even from a tight fit.

Handle for Bits for Close Work

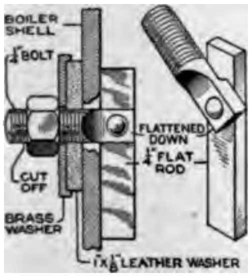


When holes must be bored, or screws driven, and there is not much space in front of the hole, the handle shown in the sketch will be useful. The shank of the bit should be adapted for it by drilling a small hole, as shown. The handle is made of a piece of steel tubing, with two holes drilled and filed out square, of the proper size determined by fitting in the bits. key of steel wire holds the bits in In case of necessity, any squar bit can then be used in the handle, whether there is a hole to take the key or not.—Henry Getaz, Pittsfield, Mass.

Simple Method of Making and Attaching a Metal Ferrule

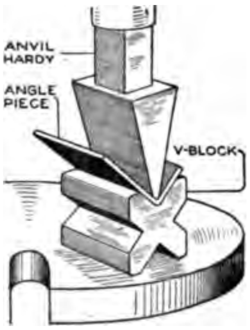
Take copper or brass wire and wrap it around the place desired—as on a file or chisel handle. Solder as fast as wound, for the heat of the iron will expand the wire, and when it cools the ferrule will be as sound as though it were solid metal, forced on. Use about No. 20 gauge wire for small ferrules; No. 14 or 12 can be used for very large sizes.—J. Garrett Kemp, Stillwater, Oklahoma.

A Durable Solderless Repair for Boiler Leaks



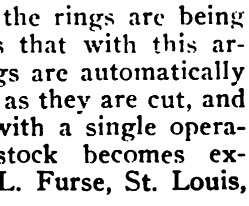
When a leak is discovered in a small tank, or boiler, such as the reservoirs on many kitchen ranges, the problem of repair is often difficult, because solder does not stick well to the corroded surface, and only one side of the tank wall can be reached for a mechanical repair. Materials required for this device are a ¼-in. bolt and nut; a small piece of rod, or sheet steel, about ⅛ by ¼ by 1¼ in.; a ⅛ by 1-in. brass washer; a ¼ by 1-in. leather washer, and a small rivet, or piece of soft steel wire. The bolt, after the head is removed, is flattened out, as shown, a hole is drilled in it, and the flat rod is riveted to it. While riveting, a slotted shim should be placed between the two pieces, so that it can be removed afterward, leaving a loose joint. The leak in the tank is enlarged if necessary, and the flat rod is pushed through the hole, long end first. When it has completely entered, it will drop to the perpendicular position, and the washers and nut are put on the bolt.

Angle Pieces Shaped in V-Block with Arbor Press



An order came in for a large number of angle pieces of odd size. To do the work quickly, and with some degree of accuracy, it was necessary to bend the pieces in some form of die in a press. Neither press nor die were available, but an arbor press and a V-block were among the shop equipment. The sketch shows how the pieces were made by the use of the arbor press, the V-block, and an anvil hardy. By bringing the plunger of the press down on the hardy the angle was formed in the V-block. The hardy should be blunt, otherwise there is danger of breaking the stock at the bend.—Harvey Mead, Scranton, Pa.

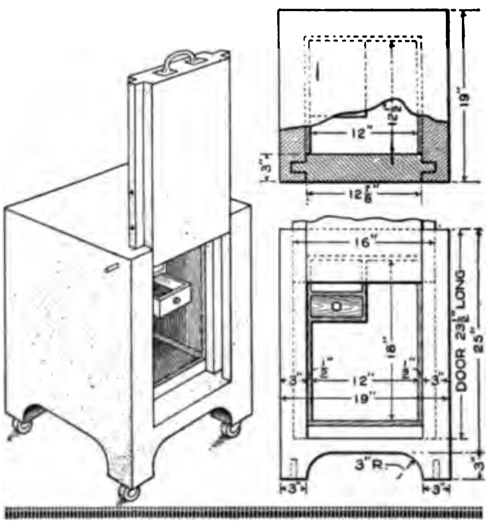
Wire Used to String Rings as They Come from Lathe



When a large number of brass, bronze, or cast-iron rings are turned from a single piece of stock, a heavy wire arranged for catching them as they come from the lathe will be found useful. The wire may be secured to any convenient point at the right-hand end of the machine. The other end is permitted to ride free inside the stock from which the rings are being cut. It is obvious that with this arrangement the rings are automatically strung on the wire as they are cut, and may be removed with a single operation when the stock becomes exhausted.—George L. Furse, St. Louis, Missouri.

How to Make a Fireproof Concrete Safe

The chief features of this safe are simplicity in construction and cheapness. About two sacks of cement are needed. If desired, the safe can be given a good black finish by mixing about 1½ lb. of lampblack into the cement.



Fireproof Safe Made of Concrete can be Built at Home at Very Low Cost

It will be noted that the door slides up to open. The door can be latched open by means of a rod spanning the opening, moving freely in holes cored into the concrete. The end of such a rod is shown in the view of the completed safe, projecting from the side, near the top of the opening. For convenience in handling, the safe should be set on casters. Mold sockets for the casters when pouring the concrete.

An Improvised Furnace for Small Casehardening Jobs

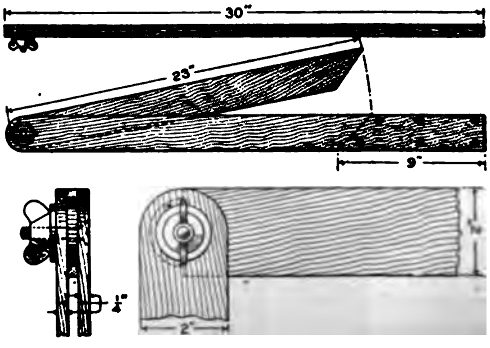
A good substitute for a casehardening furnace for small work may be had by capping one end of a length of iron pipe and plugging the other end with fire clay, after the material to be hardened has been placed inside. The pipe is then placed in the usual casehardening furnace or heated in the brazing machine.—Abel Greenstein, New York, New York.

Doors Have Removable Panels for Summer and Winter Use

Doors of permanent construction having a large removable panel are fitted with glass sashes for winter use and with screens in summer. This eliminates changing an entire door for seasonal variations.—J. S. Hagans, Toledo, Ohio.

Bevel Square for Door and Window Fitting

Openings for doors and windows are seldom square and true. Due to this condition much extra work is required when they are being fitted unless suitable methods are used. With windows particularly, a poor job is a frequent occurrence, since they have to be fitted both at the top and bottom. No correction can be made if too much wood is taken off. Trying-in doors also is arduous work. Such difficulties are greatly minimized if a large bevel square, such as that shown in the sketch, is employed. Its construction is obvious from a study of the details. The only materials needed for the construction of this tool are three hardwood sticks, ¼ by 2 by 30 in., one ¼ by 1¼-in. stove bolt, one ¼-in. punched washer, one ¼-in. wing nut, and several ⅝-in. flat-head wood screws. The size of the square is such

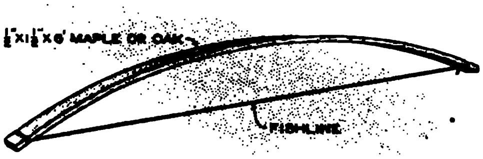


Detail of Homemade Bevel Square to be Used in Fitting Doors and Windows

that it will disclose any appreciable variation from the true in a large door or window opening and thereby permit the door or window to be cut accordingly. Yet the tongue, being 23 in. long, is sufficiently short to be used in openings only 2 ft. wide.—Henry Simon, Laguna Beach, Calif.

Snap Bow Aids in Making Chalk Lines

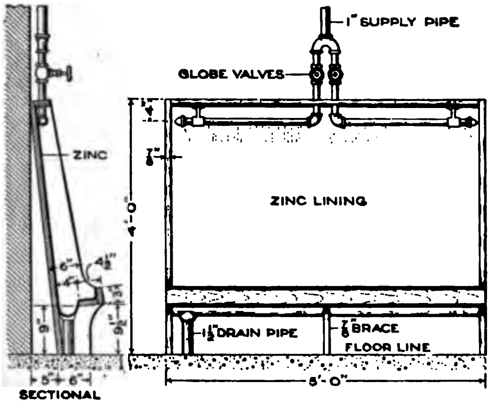
The chalk line is often much quicker to use for marking than a straightedge and pencil, but fastening the far end, or having some one to hold it, makes it inconvenient. A snap bow will enable one to use the simple and accurate chalk-line method without trouble. The fishline may be rubbed with white or colored chalk, laid against the surface to be marked, and picked with the finger. The device has been found useful in scenic painting.



The Snap Bow Provides a One-Man Way to Use a Chalkline

A Quick and Convenient Blueprint Washer

There are a great many methods of washing blueprints, but a spray washer, constructed as shown in the illustration, will prove as economical and satisfactory as any in a shop where a large number of prints are made. A wooden tray of suitable size is made and covered with zinc. The water is admitted to the tray through two spray pipes which are drilled with holes through about 45° of their lower surfaces. When a print is to be washed, the water is turned on and permitted to wet the zinc thoroughly. Then it is shut off, and the blueprint, with its sensitized side out, placed on the zinc in the back of the tray, so that the top edge of the print is high enough to prevent the water from spraying above it. With the print in position, the water is again turned on and will quickly wash off the sensitizing chemicals. Experience has shown that the prints will dry quicker when washed in this manner than when washed by soaking them in a large tray, and the prints are not so likely to become torn.—W. J. Carol, St. Louis, Mo.



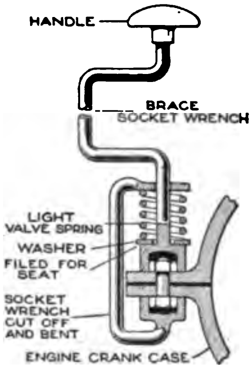
SECTIONAL ELEVATION

FRONT ELEVATION

Blueprints are Quickly Washed in Running Water with This Device. For Small Prints, Only One of the Valves need be Turned On

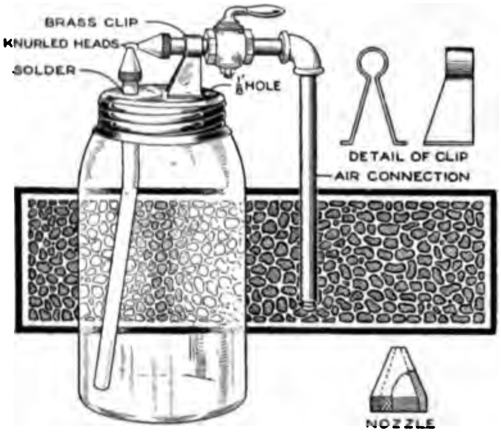
A One-Man Wrench for Automobile Crank-Case Bolts

The socket wrench shown in the drawing was devised by an ingenious repair man who had felt the shortage of workmen. It is made by combining two socket wrenches so that one holds the bolt head while the other is used in the ordinary way. The construction may also be adapted, though not so readily, to the type of wrench which uses only one handle with a head for each size of nut. The device will be quite useful in many other cases where two men would otherwise be required.



Sprayer or Air Brush Easily Made from Common Materials

Secure an ordinary preserving jar, either quart or pint size; also about 18 in. of 1/8-in. pipe, a small pet cock, an ell, and a piece of sheet brass, 2 by 5 in. Drill a hole in the fruit-jar cap to fit the pipe; also another, 1/8 in. diameter, about 1/4 in. from the edge of the cap, to act as an air vent. Thread one end of the pipe, and bend as shown in the sketch. Allow 1 in. of the threaded end of the pipe to project beyond the cap, and solder the pipe to the cap.



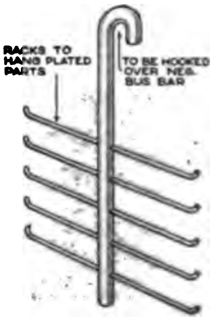
Sprayer, or Air Brush, Made from Mason Jar, for Finishing Small Parts, Such as Plaster Casts, and for Stenciling

Cut three additional pieces of pipe, as follows: one 6 in. long, and two 2 in. long. Thread both ends of the smaller pieces and one end of the 6-in. pipe. The other end of the 6-in. pipe is grooved to take the air hose. The sheet of brass is shaped into a clip, and bent so as to fit the pipe and form a support for the 6-in. pipe. Two caps, or nozzles, are turned on a lathe. The nozzles are threaded to fit the pipes, tapered, and drilled 3/64 in. at the smallest end. One nozzle is screwed to the piece of pipe on the jar cap, the other on a 2-in. piece of pipe. Assemble the parts as indicated in the sketch. The clip is soldered to the jar top and the nozzles centered.

The sprayer is now ready for work. Color is placed in the jar, and the air hose connected with the inlet of the sprayer, at the end of the 6-in. pipe. Adjustment is secured by turning the two nozzles. By having different jars with similar threads, various colors can be used without cleaning the jars. Liquid carbon dioxide is the most convenient source of pressure. Compressed air from any source is also effective. A regulator is required to vary the pressure, as heavy color mixtures require greater pressure than water colors or dyes. By having two or three outfits, different-size sprays can be obtained. Heavy colors require from 40 to 50 lb. pressure, while water colors, or dyes, require only 20 to 30 lb. Japan colors, oil, and varnish can be used. A great saving of time can be effected in painting or tinting plaster casts, artificial foliage, metal castings, papier-mâché forms, and in stenciling and similar work.—H. H. Marshall, Los Angeles, Calif.

Convenient Electroplating Rack for Small Pieces

Where a large number of small pieces are to be electroplated, time can be saved if, instead of wiring individually each piece, they are strung on the arms of a metal rack. Such a rack may be made quickly by inserting several 12-in. lengths of heavy copper or brass wire through equidistantly spaced holes drilled in a section of brass or copper rod. The wires should be soldered in place. Before the insertion of the wires, the upper end of the rod should be bent into a hook so that it can be suspended from the negative bus bar of the plating tank. Both ends of each horizontal wire should be bent upward to prevent the falling off of pieces hung on it.—K. M. Coggeshall, Webster Groves, Missouri.

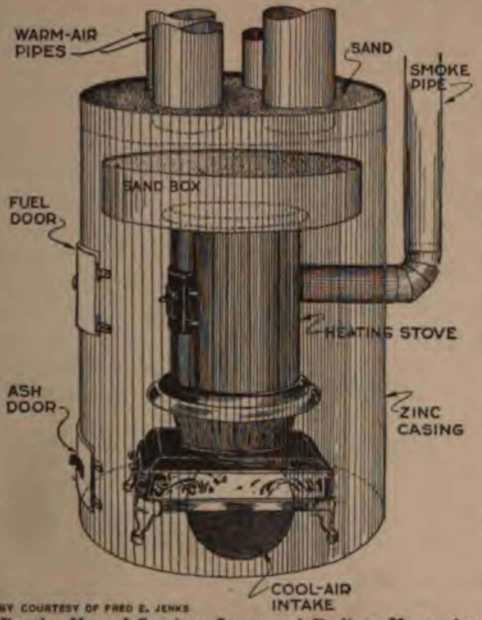


Sand Furnace for House Heating Conserves Coal

By H. L. PHILLIPS

FUEL conservation this winter is one of the big questions before the country, and the idea of using a sand reservoir for heat is offered as a contribution to the kaiser's downfall. The furnaces built by the originator of the idea have been examined by Professor Lockwood, the heating expert of Yale University, who speaks quite favorably of the success of the heater, pronouncing it ingenious and efficient.

The furnace is made from an ordinary parlor stove, which, on account of the better utilization of the heat it furnishes, will supply with warm air a number of rooms, without increasing greatly its coal consumption.



BY COURTESY OF FRED E. JENKS

By the Use of Sand to Store and Radiate Heat, the Efficiency of a Stove may be Greatly Increased, Thus Saving Coal

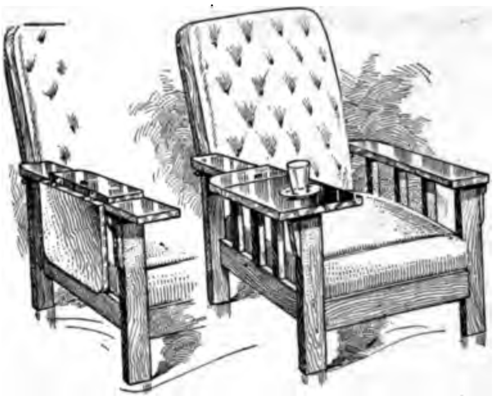
The stove is surrounded by a large cylinder of "zinc," or galvanized iron, in which doors are built for receiving coal and for taking out ashes. A large opening near the bottom of the cylinder provides the cool-air intake, and for good ventilation it may be connected to the outdoor air by a stovepipe, or large furnace pipe. On top of the stove is placed a sand box, which should be about 5 in. smaller in diameter than the surrounding cylinder, and about 6 in. high. It is made of galvanized iron, and filled with sea sand, or other clean sand. About 3 in. above this is the top of the cylinder, which consists of galvanized iron with 3 in. of sand laid upon it. Large holes are cut in the top for warm-air pipes—one to each room or register to be supplied. The smoke pipe is carried out through the cylinder, the hole being cut accurately to avoid air leakage.

In a thin-walled shore cottage, where the heater was installed, it was found to require only one hod of coal per day, in cold weather, heating the cottage to 70°. The sand furnishes no heat, of course, and cannot increase the fuel value of the coal; the results are due to the utilization of a larger percentage of the heat value of the coal, through the radiating and heat-storing properties of the sand.

¶An improvised thread gauge for measuring female threads is made by turning a soft wooden dowel into the thread. The resulting marks on the wood are then used to determine the number of threads to the inch.

A Chair Shelf That Folds Out of the Way

A shelf like the one illustrated may be made to look well, besides being very useful for writing or for holding dishes or drinking glasses. The folding member should be attached to the smaller board by hinges which are set into the wood; the small board is fastened to the arm of the chair by a single bolt on which it revolves. This bolt should be set well forward toward the hinge line, and there should be at least 5 or 6 in. of length behind it, for leverage against the weight on the shelf.—W. H. Sargent, Rutland, Vt.



A Folding Shelf for the Armchair Which may be Made Both Sightly and Strong

Tapping a Hole without a Tap

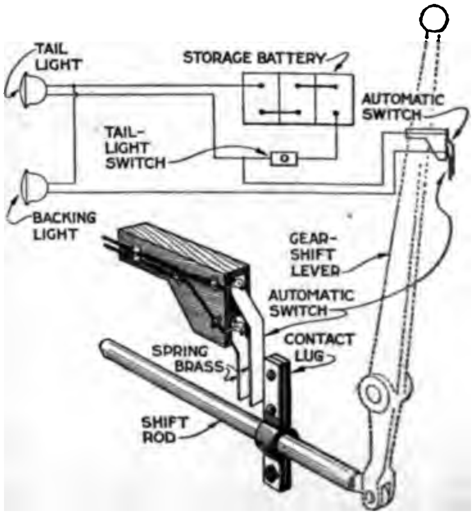
After removing a stay bolt, it was found that a tap of the proper size was not at hand. To retap the hole a stay bolt was used. Its end was pointed with a file, and grooves were filed running longitudinally as in a tap. The bolt was then casehardened, and the retapping of the hole was done in the ordinary manner.

Size for Holding Aluminum Bronze Letters

To do a job of lettering with aluminum bronze on glass, make a size as follows: Mix together 3 parts of good quick-drying varnish, 1 part of chrome in oil, medium shade, and 1 part of turpentine. This size should be fit to take the bronze in an hour after application, when it ought to have the proper tackiness. In warm weather it will be fit in much less time. But try it with the tip of a finger to ascertain when it gets tacky.—Charles Richard, Cleveland, Ohio.

An Automatic Electric Backing-Up Automobile Light

With this auxiliary lighting system, when the gear-shifting lever is thrown to the reverse position, the backing-up light and also the tail light will be illuminated and the entire road in the rear of the car brightly lighted. As shown in the upper part of the diagram, the backing-up light is wired on a separate circuit so that closing the automatic switch permits current to pass through it. The switch, as detailed in the lower part of the drawing, consists of two strips bent from spring brass. These are mounted on a wooden block which provides insulation. The block is bolted under the floor of the car. The contact lug, whereby the switch is caused to close, comprises two pieces, bent from strap iron, which are faced with fiber or rubber. Throwing the gear-shift lever to the re-



As the Gear Lever is Thrown into Reverse Position, It Switches on a Light at the Rear of the Car verse position causes the contact lug to press the spring-brass leaves of the automatic switch together, whereby the circuit through the backing light is closed. Note that the circuit is so arranged that when the tail-light switch is in the off position the backing light cannot be illuminated. For the backing light, an ordinary electric tail lamp, which has a clear lens instead of the usual ruby one, is used.—Parke Goode, Covington, Ky.

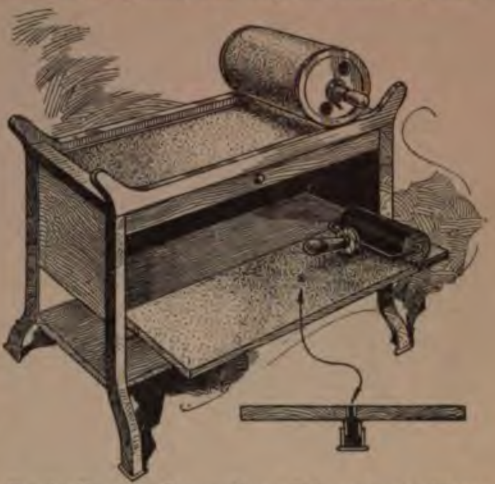
Improving Compression of Old Gas Engines

Often when old gas engines are fitted with new piston rings, the cylinder is found to be so badly worn out of round that even a new ring does not give good compression, without an excessive amount of wearing in. In such cases compression may be improved by using two rings in each slot. For best results, the joints of rings in the same slot should be 90° apart. This practice is perhaps a little more likely to give piston-ring trouble, but it may add years to the useful life of an engine.—Archibald A. Richards, Manchester, New Hampshire.

Grease Cup to Contain Ink for Proof Press

The proprietor of a print shop, having a roller proof press, became tired of the usual unsightly daub of ink on the roller shelf, and screwed an ordinary automobile grease cup into the middle of the bottom of the shelf, so that the open end was flush with the inking surface. When he needs more ink for his roller, he gives the grease cup a turn, which places the ink directly in the center of the inking shelf. It is distributed by the hand roller in the usual way.

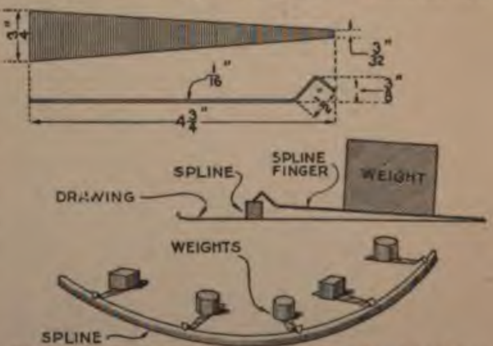
A good grease cup with accurately cut threads should be used. When the ink is all gone, the cap is removed and refilled.—Thomas W. Livermore, San Antonio, Tex.



By the Use of a Grease Cup, a Printer Avoids Waste of Ink, and Gets Better Distribution of Ink for His Proofs

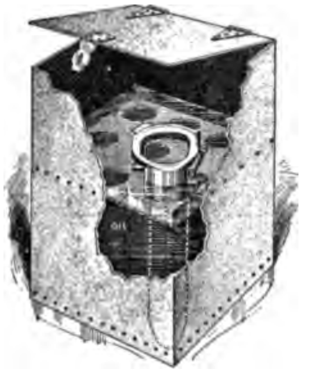
Fingers for Holding Spline Weights in Drafting

In drawing long curved lines, especially when curves are drawn from points found by calculation or measurement, a flexible ruler, or spline, is a convenient tool. One problem, however, is to hold it firmly while adjusting or drawing the curve. This may be done by providing a number of metal fingers as illustrated, with lead or other heavy weights fastened to them. The dimensions, of course, will vary with the flexibility of the spline.



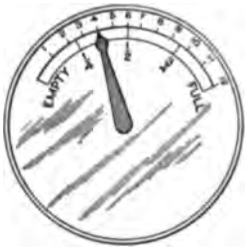
Spline Weight Fingers Made of Sheet Steel or Brass Are Helpful in Drawing Curves

Storing Air Hammers in Oil Improves Working Quality



One of the eastern railroads has found that the action and durability of air hammers is much improved if they are deposited every night in a tank of oil. The illustration shows the steel box made for this purpose. The hammers rest upon a plate with holes drilled to fit the hammers. The amount of oil put in the tank should be just sufficient that, when each hammer is in place, the oil level almost reaches the handles. — L. K., Pittsburgh, Pa.

Calibrating Automobile Gasoline Gauges

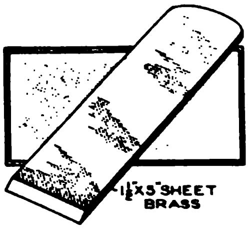


Many automobiles are provided with a gauge which is intended to show the amount of gasoline in the tank, but reads only in fractions of a tankful, rather than in gallons. The gauge may be calibrated, or marked directly in gallons, as follows: Take the glass cover off the gauge, and drain off all the gasoline in the tank. Then pour in one gallon of gasoline, using a measure which has been tested so as to make sure it holds just 231 cu. in. Make a mark on the gauge with the point of a sharp pencil to show where the pointer stands, and pour in another gallon, repeating the operation until the tank is full. If the tank is a horizontal cylinder, the spaces between the marks will look somewhat as shown in the illustration; if the tank is of irregular shape, the spaces will be irregular also.—George S. Ferris, New York, N. Y.

Removing a Broken Nipple from a Coupling

A small pipe nipple, broken off inside a coupling, was removed by driving a sharp-pointed cape chisel into the broken nipple. The chisel was then turned with a wrench, thereby also turning the nipple out sufficiently, so that a hold could be taken with a small pipe wrench for its complete removal.

Brass Scraper for Cleaning Tools



Scraping rust or dirt from saws, planes, and other tools, is a common practice, and when a steel-edge tool is used for the purpose the surfaces cleaned are often scratched or marred. A better tool for this work, and one which will not scratch the surfaces, is a sharpened strip of brass, 1½ by 5 in. long. The handle end should be rounded off, and the edges broken slightly with a file or emery cloth, to make it convenient to handle the scraper. The tools to be cleaned should, of course, be oiled before applying the scraper.

Safety Pin Makes Good Picture Hook

An ordinary safety pin makes a useful hook for hanging small pictures. Drive the pointed end of the safety pin into the wall as far as the coil, if possible, allowing the hook end to hang down against the wall. A picture hung on such a hook cannot easily be knocked down, because the point of the hook is against the wall instead of pointing outward.—L. E. Turner, Hartford, Conn.

A Spark-Plug Atomizer Starter for Automobile Engines

By GEORGE A. LUERS

A TYPE of automobile starter which can be installed with great satisfaction, on cars which were built for hand cranking only, is the one here described, consisting of an apparatus for placing an explosive mixture directly at the point of ignition. The mixture is ignited by whatever means is provided for "starting on the spark"; this varies with the type of ignition, and is not ordinarily available in engines ignited by magneto only. On others, however, means are usually provided for producing a spark when the engine is at rest.

The complete outfit is shown in outline in Fig. 1, as arranged for a car with vibrator ignition, using a battery of dry cells. A pressure pump located on the dash is connected to the gasoline line, and its discharge end is connected to a tube leading to a row of tees with an elbow at the end, which lead into the spark plugs. A plug, as fitted with this nozzle, is shown in detail in Fig. 1; almost any plug can be used, of the type where the porcelain can be removed for cleaning. With the plugs screwed in tightly, make a mark on each one to locate accurately the point which will be toward the tee; remove the plugs, and drill and tap holes into them of proper size to take gasoline-line tubing of $\frac{3}{16}$-in. outside diameter, being careful to strike the interior of the plug at a point below the porcelain. The short piece of tubing which extends from the tee into the plug should be peened down at the extreme end to an opening not exceeding about $\frac{1}{64}$ or .02 in. in diameter, so as to form a nozzle.

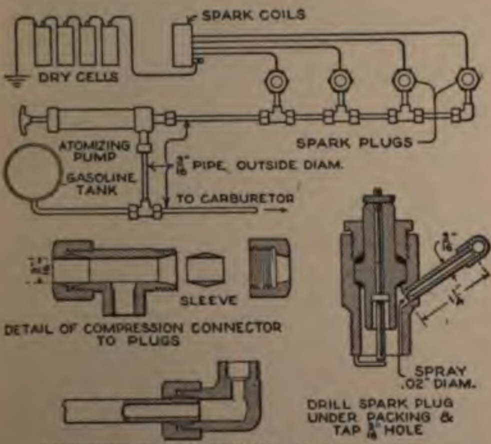

SPARK COILS
DRY CELLS
ATOMIZING PUMP
SPARK PLUGS
GASOLINE TANK
$\frac{3}{16}$" PIPE, OUTSIDE DIAM.
TO CARBURETOR
SLEEVE
DETAIL OF COMPRESSION CONNECTOR TO PLUGS
$\frac{3}{16}$"
SPRAY .02" DIAM.
DRILL SPARK PLUG UNDER PACKING & TAP $\frac{3}{16}$" HOLE
CONNECTOR TO 1ST SPARK PLUG

FIG. 1

General Arrangement of the Atomizing Automobile Starter, Showing Tubes Leading to Spark Plugs

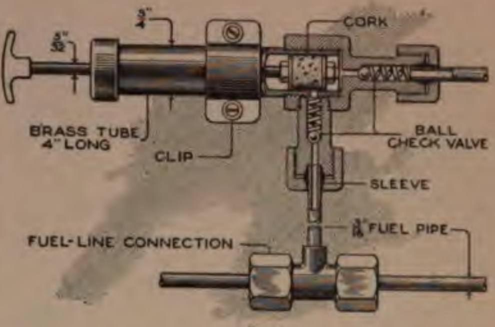


FIG. 2

The Pump Which Forces Gasoline into the Plugs can be Made in the Home Shop from Scrap Metal or from an Old Pressure Pump

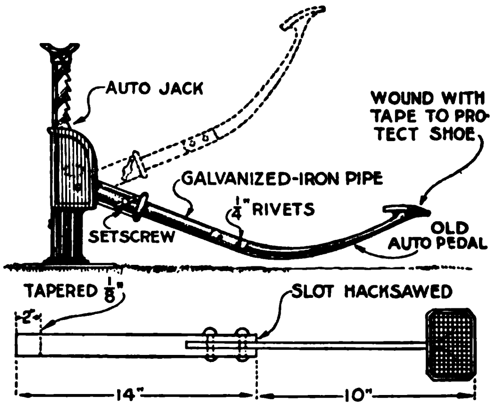
The pressure pump may be made from pieces of pipe and scraps, but an old oil pump or gasoline pressure-feed pump may be readily modified for this use. On the upstroke the pump sucks gasoline from the fuel line, and on the downstroke delivers it to the spark plugs, this action being forced by the two ball check valves shown in Fig. 2.

To operate the starter, simply push the pump handle up and down once or twice, and produce the spark by the means provided. A start should result, even in the coldest weather. It might be thought that the small opening in the spark plugs would cause loss of power; this is practically negligible if the nozzles are small enough, but can be prevented if desired by placing a ball valve in each of the tubes to the spark plugs. The expense of operating such a starter is almost nothing, and its simplicity has much to recommend it.

¶Wet shoes dry more quickly, and are held in shape better, if stuffed with newspaper.

Pedal Extension on Auto-Jack Lever Saves Labor

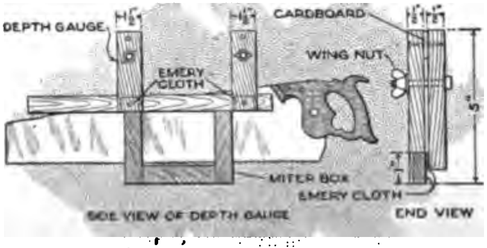
When a mechanic wants to relieve himself of some of the back-breaking work of jacking up a heavy load, he lengthens the leverage with a bar or a piece of pipe. Here is a plan to lengthen the leverage of an auto jack. The extension of the lever by adding an old pedal saves much work and soiling of clothes. The cost is nominal, as an old auto pedal is easily procured. The sketch shows how the work is done.—P. P. Avery, Garfield, New Jersey.



Auto Jacks can be Made to Work Easily by Lengthening the Leverage

Depth Gauge for Wooden Miter Boxes

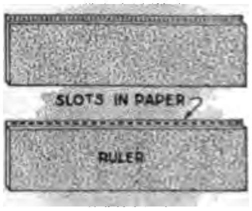
When one is making saw cuts in a miter box to a certain depth, it is almost impossible to do good work without a gauge, or stop, on the saw. While saws made for this purpose can be obtained, it is often more satisfactory to have a gauge which can be attached to any ordinary saw. The illustration shows how such a gauge can be made from a few sticks of wood, having the added advantage that it is adjustable for depth, so that much blocking up of work can be avoided. The gauge is fastened on the saw by tightening the two wing nuts. If it is desired to saw a number of slots to a distance of 1/4 in. from the bottom, for example, a good way to set the gauge is to put a piece of 1/4-in. wood in the miter box, place the saw in the box resting on the piece of wood, set the gauge, and remove the piece of wood.



Homemade Gauge Converts Any Saw into an Adjustable Miter-Box Saw

Dot and Dash Ruler Easily Made

A timesaving tool for the draftsman is a dot and dash ruler. For pencil work, the one illustrated is very convenient, and can be made with a little careful work. It consists of an ordinary straightedge with a thin strip of steel, celluloid, or hard paper, glued under it, which has a line of small holes, the proper distance away from the edge of the ruler so that a pencil point of average sharpness will just strike the holes or slots. The holes may be marked in the strip with a needle point and drilled with a small drill, or a machine-perforated piece of paper may be used, cutting out and joining together with a knife every two or three holes, for a dash ruler. If it is desired to make a complete set of rulers of celluloid, or of thin steel, for dots, dashes, and combinations of dots and dashes for center lines, etc., a good plan is to make a template of thicker metal with the round holes only. The various strips can be drilled through it, and



dash holes cut out with a small cold chisel as required.—Reginald R. Wayt, Pittsburgh, Pa.

Pneumatic Riveter Useful in Wood Shop

The compressed-air riveting machine is found to be extremely useful in woodworking establishments handling large work. It is made adaptable by fitting, instead of the hammer tool, heavy wood-cutting chisels and gouges with shanks shaped to fit in the machine. Mortise and tenon joints can be chipped out quickly and easily with the chisel tool. In the shop where large built-up work has to be shaped by hand, the gouge will be found convenient for roughing off. I have used this means several times to shape large, irregular wood patterns, such as hawser pipes and struts.—Arthur A. Richardson, Center Barnstead, N. H.

Reliable Oiling Systems for Chain-Driven Trucks

The difficulty and uncertainty of keeping the chains oiled is one of the main objections to the old reliable chain drive. Two methods of overcoming this are shown in the illustrations.

The gravity oiler is the simpler one. It consists of two oil cups, mounted on brackets, so as to be directly over the small sprockets on the jackshaft, with two tubes or spouts, A, hanging down from each so as to place the oil on the sides of the sprocket, whence it is thrown out into the chain by centrifugal force. The construction is evident from Fig. 2; the bracket is bolted to the frame, and the ¼-in. spouts are soldered to the oil cup. Enough oil to lubricate the chain once thoroughly is put in the cups just before starting on a run, and it drains out by gravity.

The pressure system, shown at the left side of Fig. 1, is more expensive, but much better and more convenient. Spouts are arranged as in the gravity oiler, but they are soldered to a pipe extending across the frame, which has a tee in the middle. From the tee another pipe runs back, through a stopcock, placed handy to the driver's seat, to an oil tank. Air pressure is provided in the tank by a tube leading to a bicycle pump, and a screw plug is provided in the tank, for filling with oil. The tank should be filled with oil while the stopcock is closed; then, while running, the stopcock can be opened whenever desired, the pressure raised to 10 or 20 lb. by means of the pump, and sufficient oil run onto the chain to lubricate it.

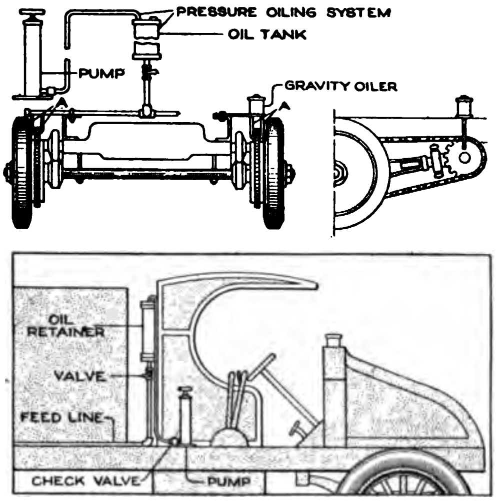


Fig. 1

The Oil is Thrown onto the Side of the Small Sprocket, and Works into the Chain

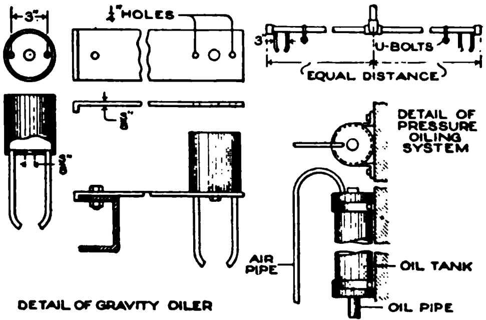


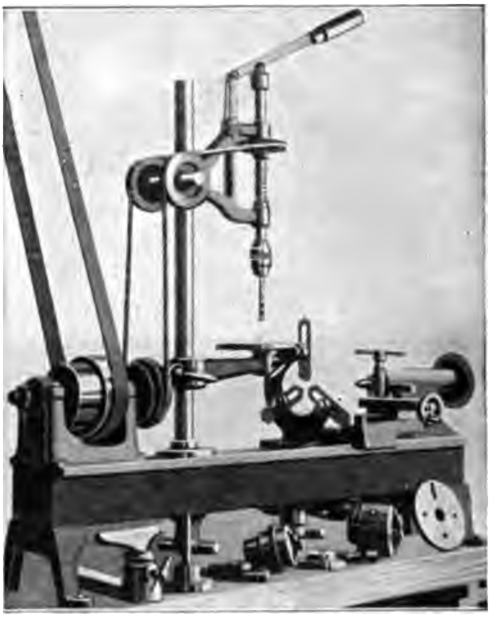
Fig. 2

Details of the Two Systems, Showing How the Apparatus is Attached to the Frame

A heavy oil should be used that will stick to the chain.—Ed. H. Samen, Chicago, Ill.

Drill-Press Attachment for Bench Lathe

In the small shop a drill-press attachment for a bench lathe, such as the one here shown, is often useful. The standard is a piece of 1-in. cold-rolled shafting, while the spindle is a piece of ½-in. drill rod. The drill-press belt is tightened by raising the head; all the clamping is done by tangent screws. The pulleys on the head run on steel pins. A lever feed forces the drill down into the work; it is returned by a spring.—James H. Beebee, Rochester, N. Y.


The Drill Press Takes Its Power from the Lathe, and can be Readily Mounted and Detached

Shellac Gives Protection against Wear

A coat of brown shellac on an automobile tire, which is to be stored or carried as a spare, will assist in preventing oxidation and deterioration.

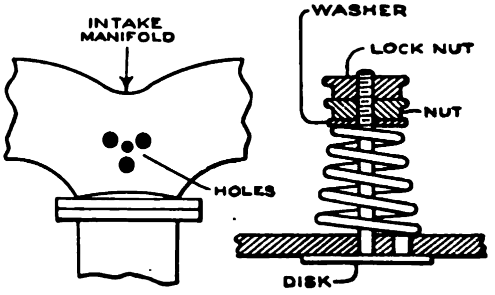
White shellac can be used on a great many articles to form a transparent waterproof coating. Drawings, photographs, printed or written documents, or any other papers which must be frequently handled or exposed to dirt, will be the better for such a coating.

Increasing the Power of an Auto Engine

The device illustrated was designed to admit additional air to the manifold, and thus completely vaporize the gasoline. At a convenient point on the intake manifold, drill three holes, ¼ in. in diameter, and one, ⅛ in. in diameter. The holes must be located within a radius of ½ in. A disk of iron, 1¼ in. in diameter, is fitted with a ⅛-in. rod, 1½ in. long. The upper end of the rod is threaded for ½ in. with an 8-32 die. The parts are assembled as shown in the sketch. The stem is riveted in the ⅛-in. hole in the center. The three ¼-in. holes are covered on the inside of the manifold with the disk. A spring is slipped over the rod, followed by a washer and two lock nuts. Use sufficient tension to hold the disk firmly in place.

Start the engine and advance the throttle about one-quarter. Release the lower nut gradually. A point will be reached where the engine gains in speed, as the vacuum formed in the intake draws down the disk covering the holes. Do not loosen the tension too much, or the engine will not throttle down to low speeds.

A roadster equipped with this device, driven by a 22-hp. engine, showed a remarkable increase in power. The results as applied to a motor truck were also satisfactory.

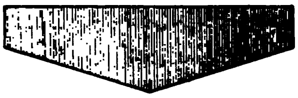


Air Valve in Automobile Manifold Increases Power and Speed of Car

Paraffin Grease for Auto and Wagon Springs

An excellent grease for inserting between the leaves of auto and wagon springs can be made by melting several candles, and adding a small quantity of flake graphite. When this is placed between the blades of springs, its replenishment is very seldom needed, as it resists the effect of water and heat better than lighter lubricants. Rust formation is prevented, and besides adding to the life of the spring, it makes the vehicle ride easier.

The Proper Shape to Cut a Shim or Filler



Shimming bolts and flues after they have been placed is a task which requires much patience. It has been found that to make the shim enter the space in the hole around the bolt or flue, without difficulty, the shim should be cut triangular. An equilateral triangle is not necessary; merely enough angle to give the shim a good starting point when rolled up. After the shim has been cut and rolled, the point is inserted into the space to be shimmed, and the shim is tapped lightly with the hammer. Due to the pointed end, the shim will conform to the space more readily than if it is cut rectangular.

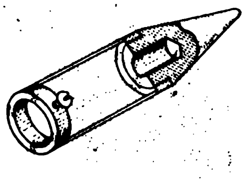
Relieve Compression of Cylinder Which is Not Firing

When it is necessary to drive an automobile or motorcycle with one or more cylinders missing fire, the compression should be relieved in the missing cylinders by opening the petcocks or removing the spark plug. This will often make a big difference in the ability of the remaining cylinders to pull the machine.—Henry Priebe, Kent, Ohio.

Small Wheels Aid Handling of Wheelbarrow

The wheelbarrow is a peculiarly useful vehicle where a load must be transported along a plank or narrow path, but where plenty of space is available it often seems foolish to carry so much of the weight in the hands instead of on wheels. Wheels can be placed on the legs of the ordinary wheelbarrow to very good advantage; they should have wide treads, and if necessary such treads can be cut from sheet iron and riveted around the wheels used. The extra wheels will prove particularly useful in going over curbstones and such elevations.—Herault A. Trester, Milwaukee, Wis.

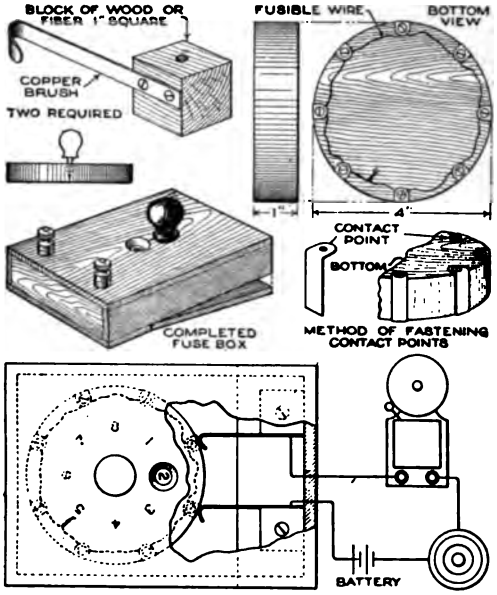
Soldering Iron for Attachment to Blowtorch



For many purposes, a soldering copper which is permanently attached to the blowtorch will do as good work as an electric soldering iron, and at a much lower cost. To make the one illustrated, cut down a short piece of 1-in. pipe to the shape shown, and fit the block of copper into the end. The copper should be forged or turned to a cone or pyramid shape, and may be fastened into the pipe by peening its inside face. A hole drilled in the copper, as shown, will cause it to heat up more quickly. The other end of the pipe frame is then fastened to the blowtorch by a setscrew. A handle may be made to fit in the same place when it is desired to use the soldering iron in the ordinary way.

A Timesaving Magazine Fuse Box for Experimental Circuits

The magazine fuse box illustrated will save many minutes when working with circuits which may blow a fuse very frequently. It consists of a rectangular box, with two binding posts connected to copper brushes which bear against adjacent contact plates of brass, mounted on a circular block of wood. A ring of fuse wire is run around the bottom of the block, and clamped with a screw under each contact plate, and a knob is provided, extending through the cover, by means of which the block can be rotated to the next position whenever an excess of current blows out the wire between two adjacent plates. The numbers on the top of the block, visible through a hole in the top of the cover, tell which section of the fuse is in use; when No. 8 shows, it indicates that the next time the fuse blows, a new wire must be inserted. This is done by opening the hinged bottom of the box; the top may be screwed on and need be removed only in case of trouble.



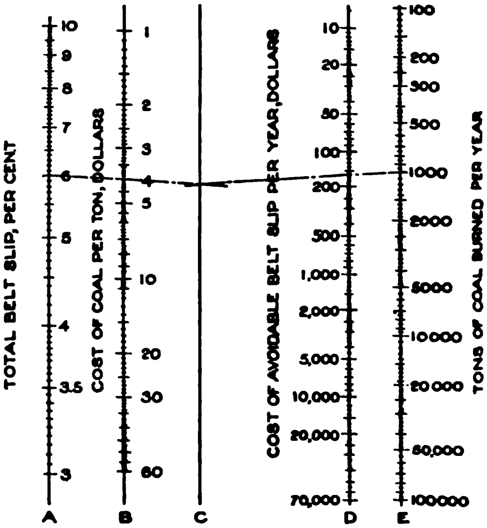
The Magazine Fuse Box Provides a Method of Quick Renewal

Unless thoroughly insulated and lined with asbestos, the device should not be used in circuits of over six volts.—W Jarand, Montreal, Canada.

Elimination of Belt Slippage Conserves Fuel

In these days when every effort should be made to conserve fuel which is so badly needed to transport soldiers and guns, it will pay every shop foreman or superintendent to look into the subject of belt slippage. When it is realized that a loss of five per cent by slippage of the main belt is equivalent to the theft of five per cent of the coal pile, and that this loss is repeated every time the power is transmitted through a belt, the matter becomes still more important.

Much study has been made of methods for saving this power, and it can be said now that by proper precautions the slippage of any properly loaded belt can be cut down to about two per cent—this amount being due to the "creep" of the belt around the pulley, and being thus unavoidable as long as the belt has elasticity. Inasmuch as the slippage on some belts may run as high as seven or eight per cent, it may

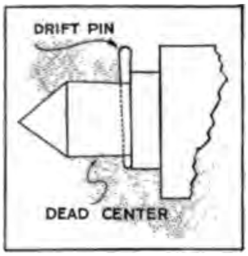


The Use of This Chart Enables the Superintendent to See How Much He Loses per Year by Belt Slip be readily seen that a considerable amount of money is involved.

A concern which markets a preparation to be used for this purpose has prepared a chart which shows readily the cost per year of belt slip to any plant, over and above the minimum which cannot be avoided. To read the chart, draw a line through the appropriate points on scales A and B, and from the point where this line intersects line C, draw another line to the proper point on scale E. The intersection with scale D will show the result. For example, when 1,000 tons per year of $4 coal are used and the belt slippage is six per cent, then the annual loss is $160.

Removing Tailstock Centers Easily by Means of Drift Pin

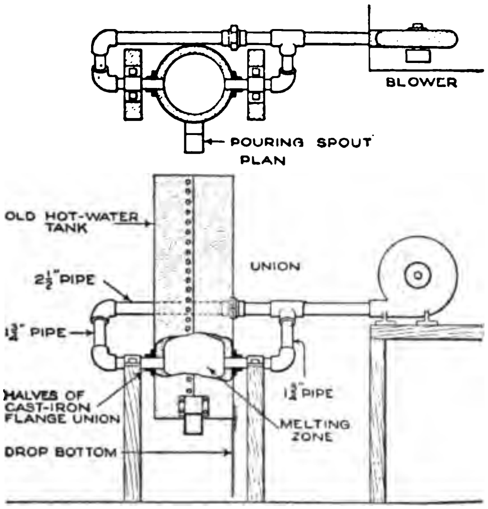
Lathe tailstocks are built so that the center may be removed by working it back to the end of its travel, when it will be pressed out from the end. This often takes considerable time and trouble, which may be avoided by fitting the centers with holes, or slots, so that they can be driven out with a few light blows on a drift pin, as is done in the drill press. The pin should be fastened with a chain, and may be carried in the oil well on the tailstock and used also for dropping oil on the dead center.—Charles R. Elliott, Los Angeles, California.



Cupola Made from an Old Boiler

A practical cupola, melting from 100 to 150 lb. at a charge, can be made from an old hot-water tank, some piping, and a blacksmith's motor-driven blower. The tank is cut off at the top for charging. The sketch shows the details of construction.

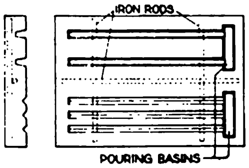
The cupola is lined with thin fire brick from the pouring spout to the top of the melting zone. The remainder of the cupola can be lined with a mixture of fire clay and sharp sand. Stove coke is used as fuel. The iron to be melted must be broken up in small pieces.—A. Gemmell, Ansonia, Connecticut.



Cupola in Plan and Elevation: The Blower Discharges through the Pipes and Tuyeres into the Melting Zone

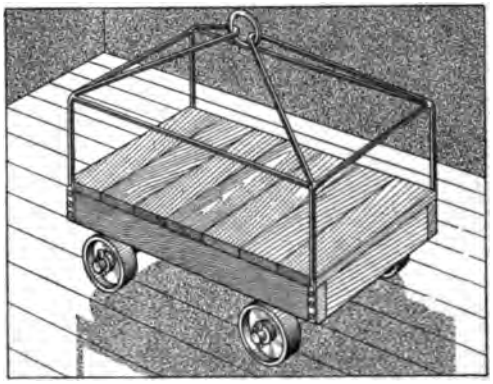
Mold for Solder Easily Made of Plaster of Paris

Scraps of solder should always be saved, melted up, and poured into bar or wire form. A convenient mold can be made of plaster of Paris. The wooden patterns for the mold should first be made; their proportions being selected to suit the user's convenience. Pouring basins should be molded at the end of the grooves, and at least ¼ in. deeper, so that the solder may run out evenly into the grooves. The plaster may be molded in a rectangular wooden frame, laid upon a glass or other smooth surface. Iron rods should be molded into the plaster in order to strengthen it.—William B. Jones, Medford, Mass.



Shop Truck That may be Picked Up by Crane

The use of a truck that can be picked up by an overhead crane, as illustrated, will save much time in handling materials. For instance, a heavy piece of machinery may be carried on such a truck to a bench; the truck can then be picked up by a crane, raised to the level of the bench, and easily transferred to it. Again, if the progress of the truck is blocked by obstacles in its path, it may be lifted over them by a crane. To convert an ordinary truck so that it may be so handled, secure two steel rods of a length depending on the size of the truck. Flatten the ends, and drill three bolt holes in each. One end of a rod is bolted to each corner. Horizontal brace rods may be welded in place, and a ring at the top is provided for the crane hook. The load should be balanced on the truck when lifted, so that it will not slide off.—Kenneth Coggeshall, Webster Groves, Mo.

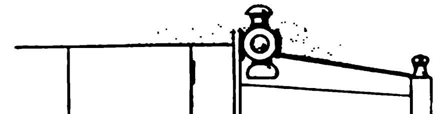

The Truck can be Carried by a Crane without Extra Ropes or Cables

Boring Large Holes in Glass

Take a piece of brass tube, about 1½ in. long, and the diameter of the hole to be made, and file small teeth in one end. Make a shank which will fit a drill-press chuck, or use a discarded drill shank. Taper one end slightly to fit into the brass tube about ¾ in. Small holes may be bored in the tube just below the end of the shank for the purpose of lubrication. Use a mixture of gum camphor and turpentine for a lubricant, to which is added a little emery flour to make a thin paste.. The speed and feed of the drill must not be sufficient to develop heat, as this may crack the glass. This is a process of wearing rather than of cutting. When the upper hard skin of the glass is cut, the drilling will progress rather easily until the lower glass skin is reached. To prevent cracking when the drill goes through, drill a small hole through the lower skin, and then ream out to size. The same method may be used to cut glass along straight lines, by using a copper or brass disk with small teeth on the outer edge, and rotating in a lathe or milling machine.—J. Garrett Kemp. Stillwater, Minn.

Testing Oil Level in Automobile Crank Cases

On some light automobiles the only method provided for testing the level of oil in the crank case is to open pet cocks, which are hard to get at without crawling under the car. By the method shown it is possible to avoid this trouble without the danger of breakage which is present when a gauge glass is used. A rectangular



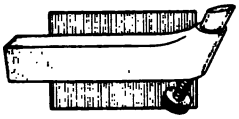
A Small Door in the Running-Board Shield Overcomes Troublesome Methods of Oil-Level Testing opening is cut in the running-board shield, and is provided with a hinged door. The door will not rattle if a spring catch is used, and it will be no detriment to the looks of the car if painted the same color.—George A. Brown, Des Moines, Ia.

Garden Hose Protects Dishes against Chipping and Breaking

An inch of old garden hose, put on the tip of the faucet, will save many dishes from being chipped or broken while rinsing the dishes under the faucet.—Charles H. Crossman, Brooklyn, New York.

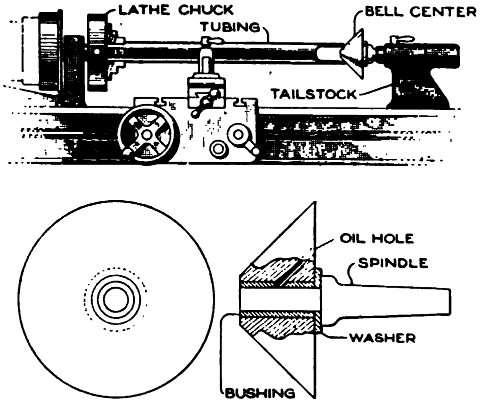
Converting Broken Drills into Lathe Tools

Broken twist-drill shanks make excellent lathe tools, particularly if the drill happens to be of high-speed steel. A holder for such pieces of broken drill is made as illustrated. A setscrew is placed in the underside of the cutter to be used as an adjustment. This permits using up all but a very small scrap of the steel. Of course the drill shank must be thoroughly hardened for this use.



A Lathe Bell Center for Turning Tubing

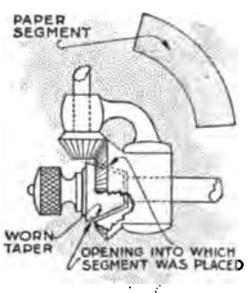
A cone-shaped tailstock center, or "dead center," which is very useful for turning tubing in a lathe can be made as shown in the sketch. The spindle is made of machine steel, or cold-rolled shafting; the cone, which revolves with the tubing, may be made of cast iron. The shank should be turned to the proper taper to fit the tailstock; the cylindrical portion may be slightly smaller, for most work. For durability, a phosphor-bronze washer may be provided to take the thrust, and a bushing of the same material, or of babbitt, may be used. The conical surface should then be turned down with an inclined angle of about 90°, as shown. The finishing cut, at least, should be taken with the cone revolving upon the spindle as it would when in use. The bushing and washer may, of course, be omitted in a center which is intended for temporary use only. In using the center, plenty of oil should be provided, both in the oil hole and on the thrust washer, which may have an oil groove cut across its face.



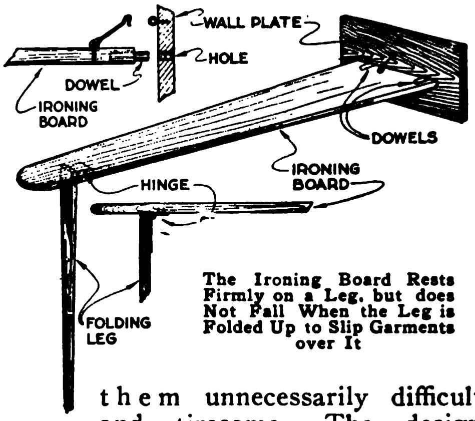
The Cone on the Bell Center Rotates with the Tubing, Holding It Firmly Centered

Paper Shim Makes Worn Taper Grip Tightly

When tapers in friction grips, and similar machinery, are so badly worn that they strike at the end instead of gripping, they may be used by inserting a paper shim. The paper may be cut from any at hand, and the general shape will be as illustrated. Cutting the shim to the exact shape is a not difficult geometrical problem, but takes more time than is necessary; the shape can be guessed at close enough after a few trials.—Joe W. Romig, Allentown, Pa.



An Ironing Board with Novel Features

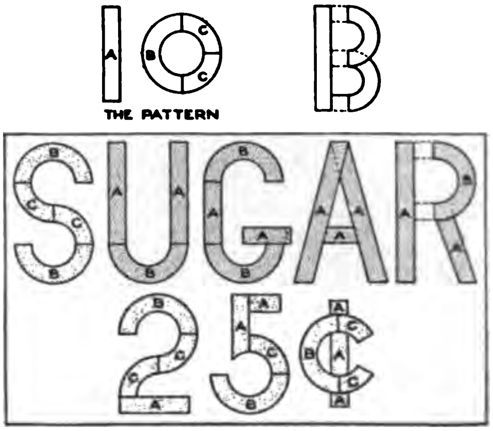


The Ironing Board Rests Firmly on a Leg, but does Not Fall When the Leg is Folded Up to Slip Garments over It

Most of the portable ironing boards are insecure. This renders working on them unnecessarily difficult and tiresome. The design detailed in the accompanying illustration shows a convenient board and furthermore incorporates features of portability and adaptability. It can be taken down and stored away in a small space. When a waist or skirt is being ironed the hinged leg may be folded up along the ironing board until the garment is drawn on the board, when the leg falls back automatically to its normal location. The dimensions may vary, but experience has shown the following to be good proportions: Make the ironing board from a 2 by 12-in. plank, 4 ft. long. Taper it down to a width of 6 in. at one end. Any convenient 2 by 4-in. stick will serve as a leg. Fasten the leg about 6 in. from the small end of the ironing board with a metal hinge or a piece of leather. For a wall plate a piece of 1 by 8 by 24-in. stock is employed. To accommodate the dowels, bore two ½-in. holes through the wall plate and into the end of the ironing board. Into each of the holes in the end of the board drive a ½ by 4-in. round iron pin. Ream the holes in the wall plate so that these dowel pins will slip into them readily. Provide a screw hook and eye to prevent the board from falling when garments are being drawn over the end, and to keep the board solidly against the wall. The wall plate should be fastened, with flat-head wood screws, to the wall of the room at the location where the board is used.—James Reid, Lumsden, Canada.

How to Make Good Signs without Special Skill

By means of three patterns cut from pasteboard, almost anyone can make good-looking signs. The height of the letters must first be decided upon, and patterns made to suit. The first is a strip, a little longer than the height of the letters, and having a width about ⅙ of this height. The other two patterns are made from a circular ring, whose outside diameter is one-half of the height of letters, and whose width is the same as the width of the strip. The circle is cut into three pieces as shown.



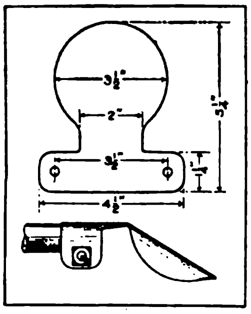
Letters for Signs are Readily Formed from Three Patterns Cut Out of Pasteboard

How these patterns are combined to form letters is shown in the illustration. The outline is drawn around the pattern in pencil, and may be filled in afterward with a brush and ink. On a few letters, such as R, short strokes may well be made freehand; this will soon come easy. With the exception of "I," "M," and "W," all letters may be made of equal width, and if desired, the spaces between all letters may be made equal. Much better appearance

will result, however, if spaces at the side of letters like "U" are made wider, and those beside "A" and "V" narrower, so that the area between letters is roughly equal.—Thomas F. Maher, New York, N. Y.

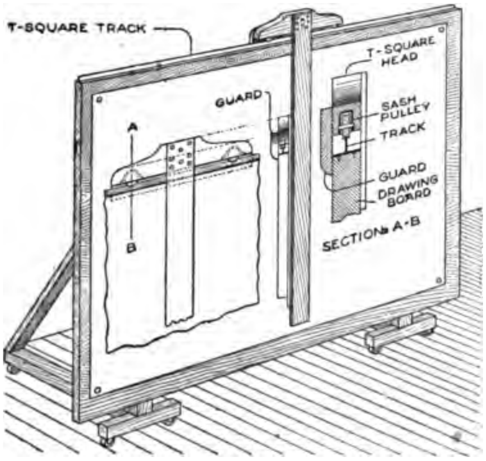
Exhaust Deflectors Keep Fumes Out of Automobiles

Motorists who are troubled by having noxious exhaust vapors eddy back into the tonneaus of their machines will find instant relief in the simple deflector illustrated. It is made from any heavy sheet metal, cut to the size and bent into the shape shown. The end which is bent to form a clamp is slipped over the tail pipe of the exhaust and bolted. The other end is then bent downward and serves to deflect the gases so they are carried away by the draft under the car.—R. O. Helwig, Chicago, Ill.



Easy-Running T-Square for Vertical Boards

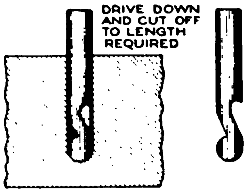
Large drawings are best handled on vertical boards. Much of the difficulty often experienced in using them can be eliminated by the use of the traveling T-square mounted on a track. Ordinary window-sash pulleys may be used, but specially turned pulleys are better for accuracy. They should be heavy in proportion to the rest of the apparatus, as otherwise the straightedge part of the square may turn up at an angle when pushed instead of moving along horizontally. The track should be made of sheet steel, heavy enough to preserve the straightness of its edge, which should be carefully trued up with a file after mounting on the board. A guard is attached to the back of the T-square head, to prevent any likelihood of the pulleys being accidentally pushed off the track. If well built, the arrangement obviates the necessity of triangles for rectangular drawing, as horizontal lines can be drawn by holding the pencil at the proper point against the square and rolling it along.—C. C. Spreen, Flint, Michigan.



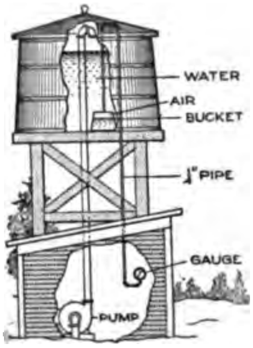
Mounting the T-Square on Rollers Is of Great Assistance in Drawing on Blackboards or Large Vertical Boards

Fitting Pins Tightly in Oversize Holes

When a pin must be made tight in a blind hole, and this is a trifle larger in diameter than the pin, it is quite a problem to make the pin hold. It may be done by flattening the pin with a hammer, or sometimes by wrapping a piece of very thin sheet steel around the pin—this being a very bunglesome way. The illustration shows how it may be done so as to hold firmly, and show no external evidence that there is a "bad fit." The method is merely to file two large notches in the pin, in about the position shown, and then drive it in tight. The pin takes hold like an expansion bolt.—Joe Cowles, Columbus, Ind.



Gauge Tells Height of Water in Elevated Tank



A pressure gauge forms a very convenient height gauge for a water tank, if properly arranged. When the tank is elevated, and the gauge is to be located some distance below it, care must be taken that the gauge does not show the pressure due to the height of the tank above the gauge, in addition to the pressure due to the actual height of water in the tank.

Whenever there is a pipe full of water leading down from the tank, its weight will read on the gauge, which must be of sufficient capacity to indicate the increased pressure, and the actual height of water in the tank does not, in such a case, show with sufficient clearness.

The method shown enables one to use a low-reading gauge, which will read zero when the tank is empty, and indicate pressures which are exactly proportional to the height of water in the tank.

A water-tight pail is inverted in the tank, with a small pipe leading upward from it, over the edge of the tank, and down to the pressure gauge. The pail is nailed down, but a small hole should be made in it near the rim, so as to allow the water to flow in and out.

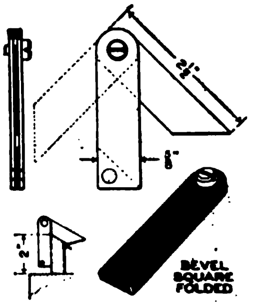
The gauge thus connected will indicate the air pressure in the pail, or .4327 lb. for each foot of water height in the tank, above the level in the bucket—which is so near the bottom of the tank that it may be considered as being at the bottom. The gauge dial may be marked to read in feet, or the marks for pounds of pressure will each indicate .4327 times as many feet as the number of pounds.—Henry R. Helander, Nesconset, N. Y.

An Emergency Handle for the Screwdriver

Needing a long, thin screwdriver handle on a holiday when it was impossible to procure one, I took a piece of drill rod of the required length, and hardened and ground the end. I then cut 3 or 4 in. of thread on the upper end and screwed down a nut until it was firm. Tapping enough copper rivets to fill ½ in. of the shaft, I used faucet washers for the balance of the handle. These were screwed on with a little glue and finished off with a nut and washer, after which the end was burred slightly to hold them tight. After tapping off the faucet washers I had a strong, neat, and serviceable screwdriver that had taken but a few minutes to make.—Charles H. Crawford, New York, N. Y.

A Small Bevel Square Made from Sheet Steel

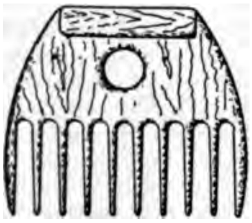
Try-squares are made down to very small sizes, but small bevels are hard to obtain, though they are often badly needed. The narrow square-edged work can usually be simply laid down on the bench, and need only be held by a stop in front. In bevel work, however, it is often necessary to clamp, or tack, the stock down firmly to the bench if it is too long and narrow to be held in the vise. In such work it is particularly inconvenient to remove the work to try it with an ordinary T-bevel.



The little tool illustrated here will be found useful to every carpenter, as in addition to being a valuable help on the bench, it will also do work in corners, narrow openings, and other places where the ordinary bevel cannot be used. The tool is made f three strips of No. 16 gauge sheet steel, each 2½ in. long and ⅝ in. wide. They are all squared on one end, and made semicircular on the other, as shown. The screw hole is drilled through two of the strips for a sliding fit to an 8-32 or 10-32 machine screw, and through the other of the proper size to take a tap. The square corner of the center strip, or blade, should be sawed off at an angle of 45°, and riveted between the other two strips, as shown. The blade is then assembled to the frame, whereupon both the blade and the frame should be trued up with a fine file.

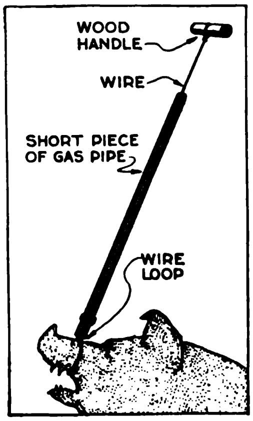
The tool folds into a flat strip, about 3/16 in. thick, and is so light that it may be carried in the pocket all day without inconvenience.

Comb for Gooseberry Picking Saves Time and Fingers



This gooseberry picker and a pair of thick buckskin gloves will save much time. The comb is made from a piece of tough hickory, or other close-grained hard wood, 6 in. square and ⅜ or ½ in. thick. One edge is divided evenly into 10 teeth, cut 2½ in. deep, and filed smooth with a 6-in. half-round wood file. Two cleats on opposite sides are fitted across the top and riveted with soft copper rivets, for a handle. This reinforced top should be about 1½ in. thick when finished. A thumb hole, made with a ¾-in. auger bit having sharp cutting lips, is bored 2 in. down from the top. It is better to bore from both sides, to make a smooth hole and to avoid danger of splitting. The edges around the hole should be well smoothed off with a knife. Finish with fine sandpaper. A low open box is needed to catch the gooseberries as they are combed from the branches of the bushes.—Herbert A. Shearer, Dayton, Ohio.

Snout Snare Makes It Easy to Ring Hogs

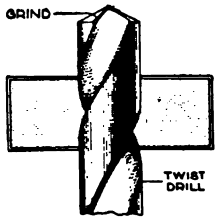


With a piece of old pipe and a loop of wire, one can handle the most vicious hog, prevent it from biting, and easily ring the animal. One end of the wire is firmly bound around a piece of broom handle. The wire is passed through a gas pipe and bent into a loop. This loop is caught on the upper jaw of the animal, and held taut against the gas pipe by means of the handle. The device may also be used for the purpose of snaring chickens by catching their legs in the loop.

Acetylene Manifold Heater Starts Cold Auto Engines

A small acetylene torch, connected with the gas tank used for lighting, will warm up the intake manifold quickly for cold-weather starting. The hose and torch can be carried in the tool box.—Sherman S. Garrett, Champaign, Ill.

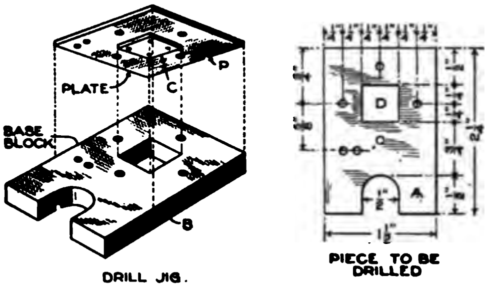
Alteration Adapts Twist Drill for Soft Metals



To modify a twist drill so that it can be used satisfactorily for drilling brass or bronze, it is merely necessary to grind off on an emery wheel the lips, or cutting edges, as shown in the sketch. This operation tends to prevent the drill from digging or tearing the hole and thereby spoiling the material.—Clifford C. Raymond.

Drill Jig for Formed Flat Pieces

A number of thin flat pieces, shown in detail at A, were to be drilled. At the left of the diagram is reproduced the drilling jig whereby the holes were drilled accurately in the locations specified. The drilling was done as follows: The piece A was laid on the base block B which rested on the table of a drill press. The plate P was placed over them. The square boss C, riveted to the lower surface of the plate, served to center the piece accurately between the plate and the base block. The drill was forced successively through each of the template holes in the plate. For the plate P, a flat piece of machine steel, $\frac{3}{16}$ in. thick by $1\frac{1}{2}$ in. square, was utilized. The boss C was finished to make a good fit in the square opening machined in the base block to receive it. After the drill holes had been laid out and drilled in the jig it was casehardened, which tends to prevent enlargement of the holes due to wear. When drilling the pieces, one drill is first used to locate all the holes. Then such holes as are to be of a greater diameter can be drilled out to the larger size in a subsequent operation.



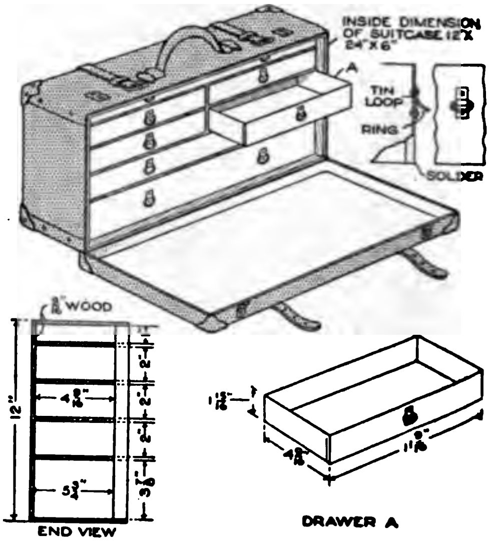
Parts and Dimensions of Jig Constructed for Drilling Thin, Flat Pieces

Bending Conduit Easily at the Workbench

Bore holes in the top of the workbench to accommodate conduit of the sizes handled. About $\frac{1}{16}$-in. diametrical clearance should be allowed. To bend the tube, insert it in the proper hole to the point where the bend is to come, and pull on the free end. Pipes up to and including $1\frac{1}{2}$-in. diameter can be bent cold. Larger conduits should be heated before bending.

Mechanic's Tool Case Made from a Suitcase

If the mechanic happens to have an old suitcase, he can convert it into a tool case that will answer as well as a case bought at from $7 to $10. A drawer frame, or insert, is made of $\frac{3}{16}$-in. white wood, divided and joined as shown in the sketch. The frame is fastened in the suitcase by four small screws and flat nuts, or by copper rivets. The drawers are made of XX heavy sheet tin, soldered. A light ring is clamped and riveted to the front center of each container. The top compartment is for plans, data, delicate instruments, etc. The heavy tools are placed in the bottom compartment, and those above are for miscellaneous tools, nuts, bolts, small parts, etc. One of the compartments might be reserved for lunch. This case is very handily laid out, and should prove very serviceable to mechanics who have to travel to emergency repair jobs, and other work.—**P. P. Avery, Garfield, N. J.**

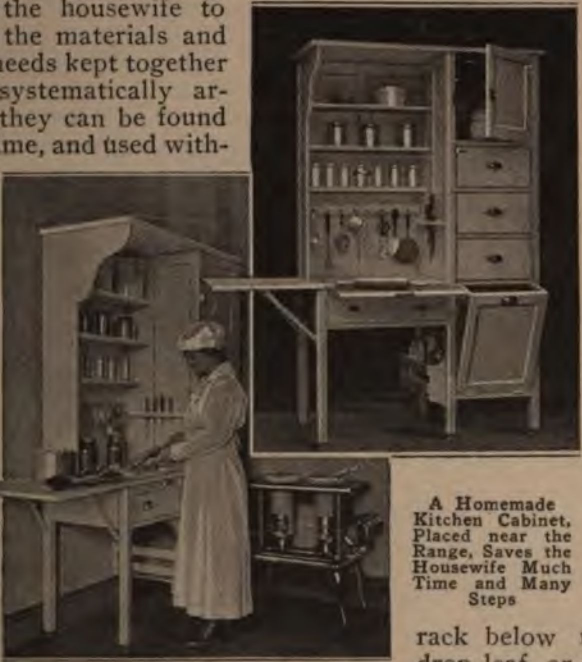


This Tool Case, Made from an Old Suitcase, Provides a "Place for Everything and Everything in Its Place"

How to Make a Sanitary Kitchen Cabinet

By S. R. WINTERS

THE modern discovery that saving of steps can result in a vast increase in human efficiency has found its way into the kitchen chiefly in the form of the modern kitchen cabinets. These are built with the idea of making it possible for the housewife to have nearly all the materials and tools which she needs kept together in one place, systematically arranged, so that they can be found without loss of time, and used without being carried across the kitchen. The cabinet should therefore be placed very close to the range, a good position being that shown in the lower photograph.

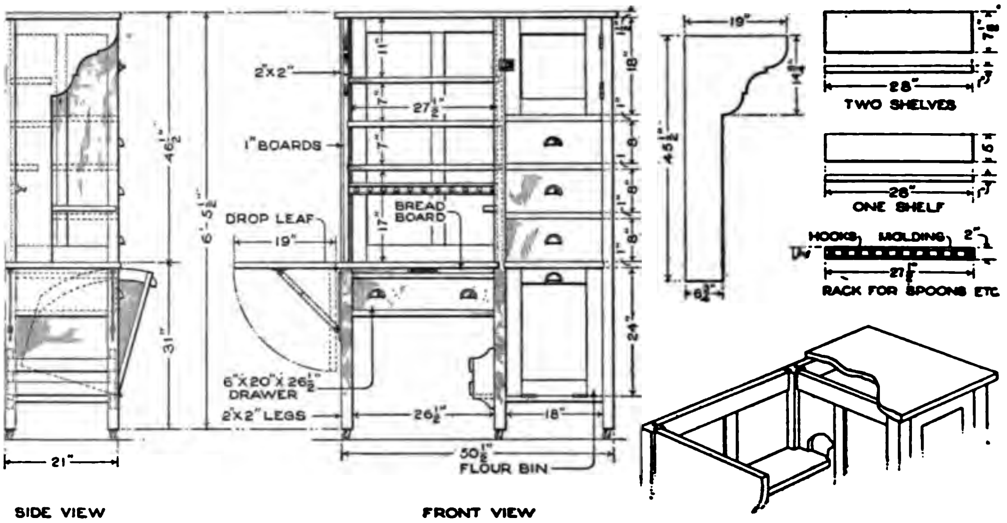


A Homemade Kitchen Cabinet, Placed near the Range, Saves the Housewife Much Time and Many Steps

The construction of the cabinet is evident from the two photographs and the working drawings on the next page. Almost any kind of wood will do, if it is well-seasoned and reasonably clear. The cabinet is 6 ft. 5½ in. high, from the casters to the top of the closet, and 31 in. to the top of the table; it is 21 in. deep and 50½ in. wide. The part below the table contains the flour bin, a large drawer, rack, and dough, or pastry, board. The bin is fastened to the frame with loose-pin hinges, so that by removing the pins the bin can be taken out, cleaned, and replaced. The bin can be lined with tin to make it free from moisture, insects, and rats. The bread board is made of wood that is tasteless and odorless, and fitted in the opening just below the table. A batten is tongued and grooved on each side of the board to prevent it from warping. The roomy drawer can be used for small utensils. The open space below the drawer is a good place to keep the kitchen stool, or the fireless cooker, when not in use. Pie pans, lids, and covers have a convenient place in the rack below the drawer. A drop leaf, or folding shelf, 21 in. wide and 19 in. long, increases the table surface; it is supported by inexpensive folding brackets.

The upper part of the cabinet consists of a closed compartment, three drawers, three open shelves, a knife rack, and a row of screw hooks for hanging kitchen utensils. The closed compartment is for package goods and large utensils; the drawers are inviting for depositing kitchen linen, package goods, and other things needed in daily use. The lower shelf is 5 in. in depth, while the upper shelves are 7½ in. On these shelves are kept coffee, tea, sugar, and spice jars, and canned goods. Three inches below the lower shelf there is a strip, 1½ in. wide, which holds screw hooks on which are hung strainer, measuring cup, and other small conveniences.

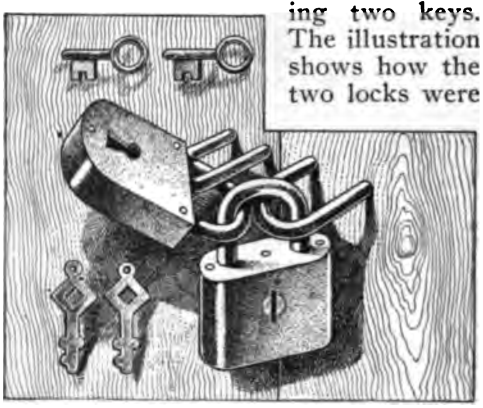
To make the cabinet attractive and easily cleaned, it should be finished with two coats of white paint and one coat of white enamel.



Construction of the Cabinet: Shelves, Hooks, Drawers, and Compartments are Provided for Almost Everything Required in the Kitchen

Four Men Use Two Padlocks on One Door

Four men wished to lock a door in such a way that any one of them could unlock it; they had two locks, each having two keys. The illustration shows how the two locks were combined to serve the purpose. Each man unlocks whichever lock his key *fits, and the door* can be opened. When he has finished, he closes his own lock on the staple; if one of the men carrying the other kind of key is using the locker at the same time, the door is left open until he has finished, when he closes his lock through the other one.—Ernest Schwartz, Brooklyn, New York.



By Closing the Two Locks into Each Other, Four Men, Although Carrying Different Keys, Have Access to the Same Locker

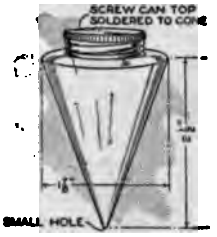
Counterweights on Portable Drills and Other Heavy Tools

In a factory where a careless operator had allowed an expensive electric portable drill to roll off the bench and become ruined, similar drills were suspended by sash cord from 2½-in. iron pulleys held up with 1-in. screw eyes. The other end of the cord carried a counterweight, which just balanced the drill at any height. A knot was tied in the cord above the drill to prevent its getting out of reach when raised. The cord was attached to a band, bolted around the drill at its center of gravity, so that it remained suspended horizontally.

Using Hacksaw Blades with Broken Teeth

When a hacksaw blade loses some of its teeth, grind away the teeth at each side of the damaged portion, in a slanting direction, so that the stubs of the broken teeth can slide over the work without breaking, and the remaining good teeth can do the cutting. This process will often enable the workman to finish a job which might otherwise be held up.

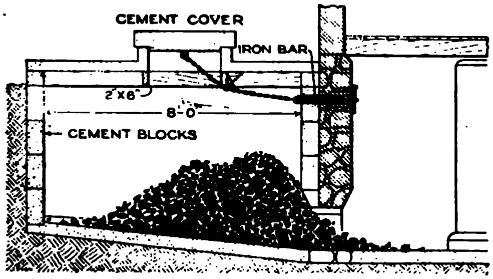
Cone Container Conserves Powdered Emery



Those who use emery dust for grinding valves and joints, and for similar purposes, will find the container shown in the sketch a useful tool. It is made by soldering a 1½-in. screw can top to a cone formed of tinned sheet iron. Emery may be sprinkled out through a small hole at the apex of the cone. The diameter of this hole should be proportioned in accordance with the fineness of the emery powder used. Thus the exact amount of dust required can be applied to the surface which is to be ground.—J. R. Minter, Washington, Ind.

Outside Coal Bin Provides Convenient Storage

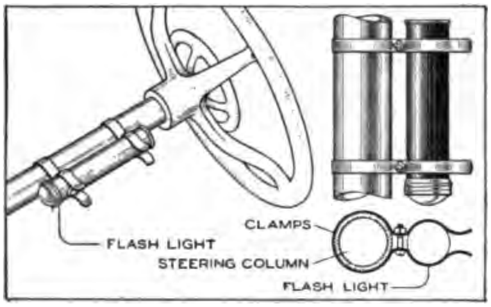
Many householders are prevented from laying in an early coal supply by the smallness of their coal-storage capacity. When space in the basement is scarce, a coal bin built just outside the foundation wall becomes desirable. The one illustrated was built of cement blocks, with a cement roof just above ground level, supported by wooden rafters. A heavy stone cover, which need only be removed for receiving coal in the bin, provides considerable security against theft of coal, and if greater security is desired, it is only necessary to attach a chain to the bottom of the cover and fasten it through a hole in the basement wall. The floor of the bin should slope toward the opening, from all directions, so that the last shovelful of coal will come into position when needed. From 40 to 45 cu. ft. of space should be provided for each ton of coal to be stored.—Richard Chambers, Lynbrook, L. I.



Building the Coal Bin Outside the Foundation Wall Keeps the Coal Safe and Handy and Saves Cellar Space

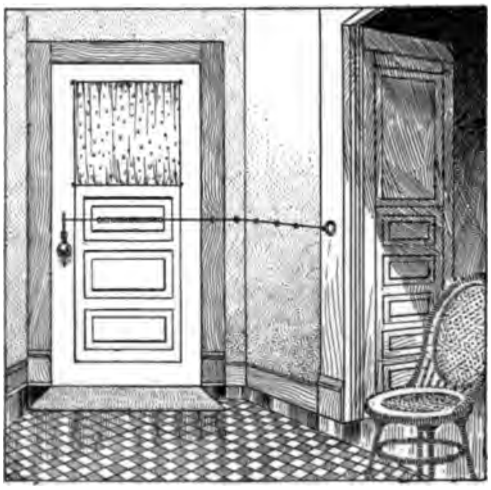
Flash Light on Automobile Steering Column

To keep the flash light handy where it will not get lost, and at the same time have a dash, or speedometer, light, it is only necessary to fasten the flash light on the steering column, as shown in the illustration. The light can be removed instantly from the spring clamps, which are made of pieces of an old clock mainspring, or any other pieces of thin spring steel. The screw holes may be punched through the spring steel, or it may be annealed and retempered after drilling the holes.



A Flash Light Attached to the Steering Column Provides a Dash Light and Trouble Light in One

Door Latch Controlled from Kitchen Saves Many Steps



A Cord Attached to a Lever on the Door Knob will Save Much Time in Many City Flats

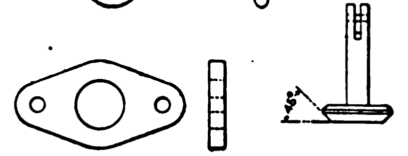
In many city apartments there is a long private hall with the entrance door at one end, and rooms all along it. Usually the kitchen is at the end of the hall. Many tedious steps to answer doorbells can be saved by means of a steel wire attached to the door knob, running through screw eyes placed in position for the purpose, to the outside of the kitchen door. A handle is then attached to the wire, by pulling on which the door knob may be turned and the door opened when the bell is rung. The door is best provided with spring hinges to close it, and a weak spring may be placed around a section of the cord to take up the slack, the ends of the spring being attached at the proper places on the cord to insure doing this. The cord is drawn taut when in use.

Fitting Bearing Adjustments Accurately

Refitting main bearings and connecting rods sometimes brings the slots in the castellated nut out of line with the cotter-pin hole in the bolt. The *safe and sure way* is to fit the nut to the *new position,* rather than to use "dutchmen" in the form of liners. Note how far the slot on the nut comes out from the hole in the bolt, and dress down the flat side of the nut with a file. A few rubs with a good file will make the nut fit in a workmanlike manner.—W. H. Thomas, Cedar Rapids, Ia.

Wedge-Clamp Jig Helps Speed Up Production

Holes in small, thick pieces must be drilled rather than punched for accuracy, even when produced in large numbers. Much of the cost of drilling is represented by the time necessary to clamp the part securely in the jig, so that the holes will be accurately placed. The jig illustrated enables the piece to be inserted as rapidly as in a punch-press die. In the piece to be drilled, the dimension to be made accurate was that between the two small holes, the center hole being left rough. Instead of having an ordinary jig, where the part must be laid between gauge pins and lifted out vertically when it is finished, the piece is merely shoved in on a flat surface against stop pins, and is clamped down by a lever operating a wedge-shaped plug which fits the center hole. The lever can be operated by the left hand as the drill-press lever is worked with the right.—John Havekost, New York, New York.



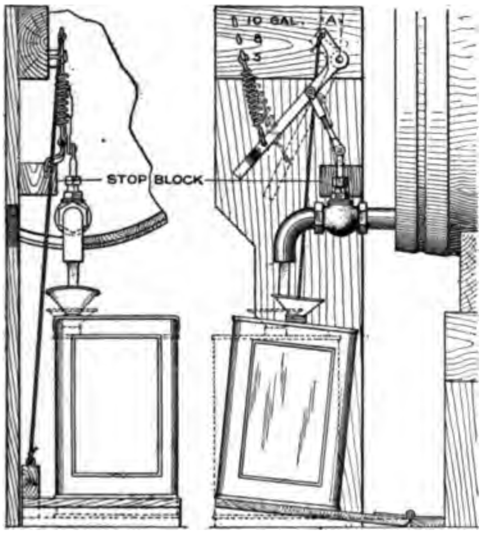
The Method of Clamping Employed Enables the Operator to Insert and Remove the Piece Much More Rapidly Than in the Conventional Jig

Automatic Shut-Off for Filling Cans or Buckets

By J. C. WINTERBURN

MANY gallons of gasoline and oil are wasted because cans are filled too full, and overflow. It is not difficult to make a link motion to operate the valve, which will save both the liquid sometimes wasted and the time and care constantly required to keep from wasting more.

The valve is an ordinary globe, or pressure, valve, the stem of which has had its threads filed down smooth, handle removed, and packing renewed. In place of the handle is fastened an adjustable link, which consists of a bolt with flat head, screwed into a threaded tube which is also flattened and drilled at the other end. The other link is made of a stiff scrap of sheet steel, shaped as shown; one end is fastened to a coil spring, and from the other a cord or wire extends down to the hinged platform, on which the can to be filled is placed. Any number of hooks or nails may be provided on which to hang the springs, each one corresponding to a certain number of gallons of the liquid to be drawn. The position of these hooks can best be found by experiment, pouring a measured amount of liquid into the can, and then finding the point where the spring must be attached to make the valve close as soon as that amount of liquid is in the can.



When the Liquid in the Can Reaches the Proper Height, Its Weight Works the Toggle-Joint Linkage, Closing the Valve

The action is as follows: Place the empty can in position, and attach the spring to the proper hook, thus opening the valve. No more attention is then required; whenever the proper amount of liquid has flowed out, its weight pulling on the cord overcomes the pull of the spring, straightens out the toggle joint formed by the links, and thus closes the valve. Before removing the filled can, the spring must of course be detached from the hook; the weight of the platform is then sufficient to hold the valve closed.

Several points must be borne in mind when proportioning the various parts:

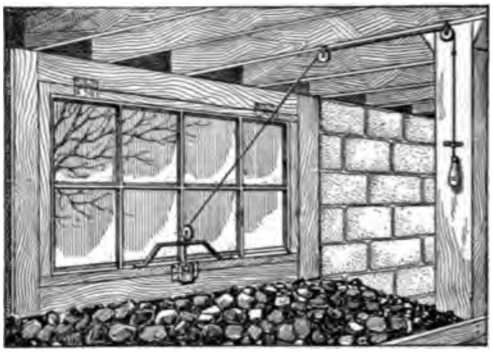
The lower end of the cord should be attached much farther from the hinge on the platform than the upper end is from the link pivot, so as to reduce the amount of motion of the platform; otherwise too large a funnel will be required, or the liquid may spill.

The lever to which the spring is attached should be made long, as shown, and a long spring should be used, but weak and flexible enough so that it will have to be stretched in attaching it to any of the hooks. If this suggestion is followed, and the link is shaped so that the end to which the cord is attached makes an angle of about 45° with the cord, then the valve will close suddenly as soon as the proper weight is reached by the liquid in the can. Otherwise, as the platform swings down, the increase of the lever arm A, tending to close the valve suddenly, will be overcome by the increased pull of the spring, and the valve will close only partly until sufficient liquid flows in to close it entirely.

The length of the adjustable link must be made such that the valve will be closed tight as the end of the long link strikes the stop block.

Timesaving Device to Open and Close Cellar Windows

When the coal bin in the cellar is well filled with coal, it is often troublesome to get at the cellar window above in order to close it. A number of devices for controlling such a window from a distance have been made and described, but most of them have the disadvantage of being either too complicated or too inconvenient in use.


A Very Simple Arrangement for Opening and Closing the Window over the Coal Bin

The one here illustrated is made from three pulleys, a cord with a handle on its end, and an old piece of strap iron. The cord is fastened, as shown, to the spring latch usually found on cellar windows, and extends at an angle toward the place from which the window is to be controlled. As will be seen, a pull on the handle first unlatches the window, then pulls it open, and holds it so by means of the catch and the knot in the string. When the window is to be closed, the cord is released, and the window slams shut. If the hinges work hard, or the window is too light to latch itself without pressure, a weight may be attached to the inner side of the window.

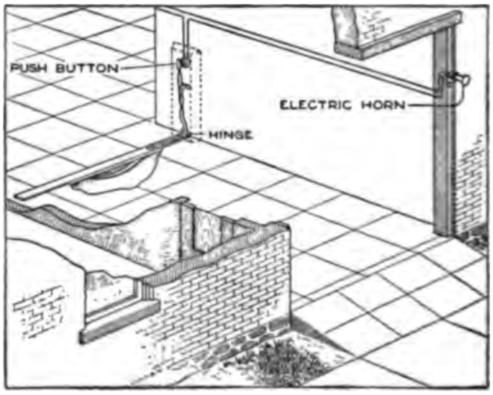
Clogged Spout Readily Cleaned with Hose

If the spout leading down from the eaves trough becomes clogged with leaves, and a water hose is handy with sufficient pressure, the pipe may be easily cleaned out thus: Remove the nozzle from the hose, and insert the hose at the top of the clogged pipe spout. Turn on the water, and as the dirt is driven out at the top or bottom, work the hose down until the pipe is clean.—James H. Beebee, Rochester, New York.

Car Leaving Garage Automatically Gives Warning

The plan of having an electric automobile horn placed in the entrance of a garage to notify pedestrians that a car is about to cross the sidewalk is not a new one, but the operation of the horn usually depends on the memory of an employe. Link motions for doing this automatically can, of course, be built in many different ways, but are likely to give trouble from being too complicated, from failure to work at the right time, or a possibility of working at the wrong time.

In the illustration, a long lever is set into the cement floor across the garage exit, having underneath it a strong spring, so that it cannot be depressed by the weight of a man anywhere upon it, or by the weight of a car, except as a wheel crosses its outer end. The end near the hinge is sunk flush with the floor. A simple link motion pushes a button which connects the horn either to a battery of dry cells, or to the 6-volt testing mains, which are available in many garages.



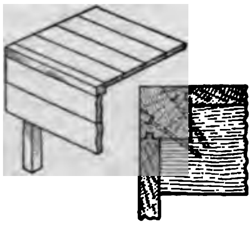
A Well-Arranged and Strongly Supported Floor Lever Makes Practicable an Automatic Arrangement for the Garage Entrance

Old Piston Used to Polish Rebored Cylinders

When an old automobile or gas-engine cylinder has been rebored for the use of new pistons, the old pistons may be made use of to lap out the cylinder before fitting in the new ones. Split the old pistons in half, and place expanding wire springs on the wrist pin, so as to force the halves of the piston apart; then work them through the cylinder with oil and fine emery, finishing with pumice.—H. G. McQueen, Dow City, Iowa.

Removable Heavy Edge for the Bench

The weak part of a carpenter's workbench is the upper edge of the working side, particularly where the vise works against the side, and the upper part, if the bench must also serve as vise jaw. The edge wears away rapidly, and to renew it means considerable trouble, without the satisfaction of permanent relief. This condition is entirely remedied by the solid edge here illustrated. A solid piece, made from 4 by 4-in. surfaced stock, forms the edge, the side and top being either matched into it, which is preferable, or simply joined onto it. The cleats, or joists, are cut off at the corner and mortised into the edge, as shown at the right, and the edge is fastened to them by spikes, having their heads sunk well below the surface. The heavy edge stays straight and true indefinitely, and does not work loose, because of its heaviness and the fact that the spikes are set into the wood at an angle to the direction of all strains thrown upon it.



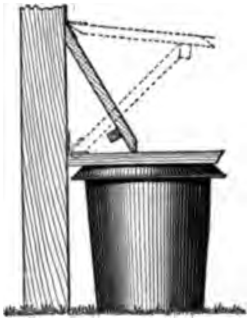
A workbench made of soft wood can by this method be provided with a hardwood edge, in which case the edge piece need be of only 3 by 3-in. stock. —Henry Simmons, San Diego, Calif.

Safety Radial Tether for Animals

To tether a horse or cow so as to admit of its having a large feeding range, and yet so as to be perfectly secure and require no attention, a pole, 20 or 30 ft. in length, is pivoted at one end and fitted with an iron ring large enough to slip along from end to end. The small end of the pole is supported by a light metal wheel from some old farm implement, or a wooden one cut from a piece of plank. The animal is fastened with a halter chain, too short to get tangled up with the animal's legs.—Joseph G. Allshouse, Vandergrift, Pennsylvania.

To Keep Animals from Molesting the Garbage Can

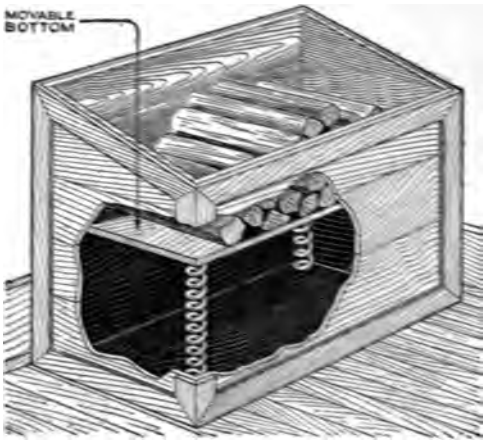
The refuse pail in the back yard is attractive to cats and dogs, and sometimes to rats. Often the pail is thus tipped and the refuse spread on the ground. The contrivance illustrated remedies this condition. The pail is placed near a clothes post or fence; a narrow strip is hinged to the post, level with the top of the pail. A second strip is hinged above the first at about the angle shown.



When both strips are down, the upper one falls and rests on the lower, checking it from being raised unless the upper one is first raised. To release the pail, raise the upper strip; then raise the lower strip to engage the cleat on the upper one.

Self-Raising Box Bottom Aids in Obtaining Contents

Many people are now using wood to save coal. One family eliminated the back-breaking job of picking sticks out of the bottom of the wood box by putting in a self-raising bottom for the box. Four springs were found and fitted one in each corner, holding up the movable bottom to a height of 12 in. When wood is placed in the box, its weight forces down the movable bottom. When the wood is nearly used, the springs raise the last sticks up so that they can be obtained without great effort. The same arrangement could be used on any chest or box where supplies, such as grain, tools, or coal, are kept in a deep box, thus making it easy to get at the contents.



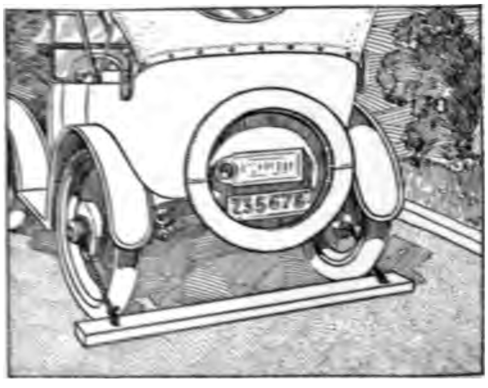
By Mounting a False Bottom on Springs in the Fire-Wood Box, the Wood is Always Kept near the Top of the Box

Draining Pipes in an Unoccupied House for the Winter

When a house stands unoccupied during the winter, it is necessary to see that the water is drained from the pipes as much as possible, to prevent freezing and causing cracks in the pipes and fittings. Any house owner can do this for himself, and save the plumber's bill, if he understands the piping system First turn the shut-off valve on the supply pipe where it *enters the house*; sometimes there are two or more of these on branches of the supply pipe. This shuts off all water from entering the house, and allows the water in the pipes to drain out entirely except for a few sections. Flush the toilet and open the sink faucets, and there then remains only the water in the water traps, or U-shaped sections of pipe which prevent sewer gas from entering the house. With rags soak up all the water in the toilet bowl, and pour into it 1 qt. of kerosene, which forms a seal for sewer gas. The water in the sink, washbowl, and bathtub traps cannot be so easily removed, but by pouring 3 qt. of kerosene down the sink drains, the water is carried off and the oil left in the trap. For complete security, have the water company or the city water department turn off the water at the curb.

Moving a Crippled Automobile Single-Handed

A piece of timber, fastened with ropes to the rear hubs of an automobile, is a great help when it must be moved by hand, and by one man only. If the transmission mechanism is not injured, the easiest way to propel the car is often by the use of the starting crank. Put the car in low gear, and relieve the compression by opening pet cocks or removing spark plugs. With the timber behind, to keep the car from slipping back, the job will then lose most of its difficulty.—**Bonar W. Balfour, St. Catharines, Ont.**

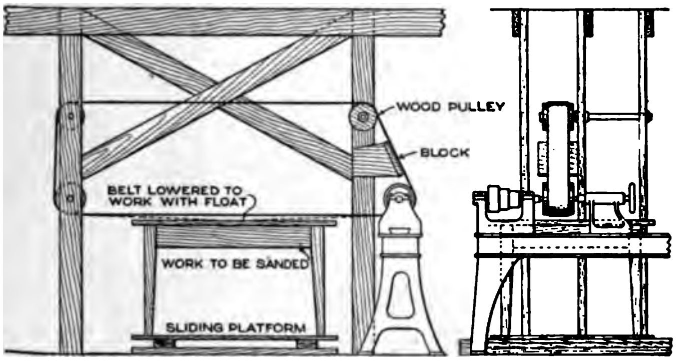


The Use of the Starting Crank and a Self-Adjusting Stop Block Makes Hand-Propelling Easy

Inexpensive Belt Sander Made from a Lathe

By HARLIE GARVER

A SERVICEABLE belt machine for sanding wood surfaces can be very easily rigged up from material about the shop, in connection with a woodworking or high-speed lathe. Build up four solid wood pulleys with 8-in. faces and 10-in. diameters, turn them in the lathe and give them a very slight crown to make the belt run smoother; too much crown will be injurious to the belt. Rig up the pulleys somewhat as shown in the drawing, centering one in the lathe on a firmly held arbor, and mounting the other three on shafts which may be made of iron pipe. Turn and file a true journal surface on the pipe, and pour a babbitt bushing in the pulleys; provide grooves in either the pipe or the babbitt to carry oil. If the shafts are supported as shown, the belt can be removed without taking the shafts out; if this feature is not desired, however, greater strength will be secured by supporting the shaft on both sides of the pulley.



Wood Surfaces can be Quickly Dressed Smooth with a Belt Sander Operated from the Lathe

The garnet-paper belt used for such a machine comes in 50-yd. rolls, and costs about $5 for the 6-in. width, which is the best for the purpose. Grade No. 1½ is best for general work. To prepare the belt, cut it to the proper length, so that the ends just meet when stretched over the pulleys. Then spread glue over the paper on the smooth side, near the joint; first splice it with a piece of cloth about 1 in. wide, and then with one about 3 in. wide. Lay a piece of paper over each side to prevent the glue from sticking, and clamp, placing a small board on each side next to the paper. With a sander of this kind it has been found that the best speed is about 2,500 ft. per minute. The cone pulley of the lathe will usually allow for proper speed.

In operating the sander, the work is adjusted at such a height as to leave about 1 in. between the surface to be sanded and the belt. The machine is then started and the belt pressed down to the surface with a float, similar in size and appearance to an ordinary blackboard eraser, or with a roller, which can be made to suit the operator and the class of work to be done. In factory-made machines the adjustment for height is made by an easily adjusted platform, upon which the work rests. A sliding arrangement also allows the work to be moved to and from the operator as it is being sanded. It is quite troublesome to rig up such a device, however, and a table will usually serve for flat pieces, especially if it is set upon a low platform as illustrated. The sliding mechanism consists simply of two sets of tongue-and-groove joints, fastened at right angles to the belt. In case table tops are to be sanded, the assembled table can be placed upon the sliding platform. For irregular work the operator can usually place some kind of support to serve the particular case. Small work can be handled on a block which may be mounted just above the lathe, the block being detachable if desired, so as not to interfere with the use of the lathe.

The upper pulleys may, of course, be omitted, but the added convenience and safety, which they provide by getting the returning belt up out of the way, amply justify the trouble of providing them.

Outside Cistern Pump Operated from the Kitchen

In using this peculiarly arranged pump, the housewife turns a handle in the kitchen, and the water is delivered into the sink, although the pump is entirely outside the house. A chain pump is used, with the shaft lengthened to extend through the house wall, and a pipe from the pump spout also runs into the house, being set to slope slightly so that the water will flow freely.—Allen P. DeLong, Tarkio, Mo.

This Outside Pump is Used with All the Convenience of an Inside Pump

Emergency Fuse Repair

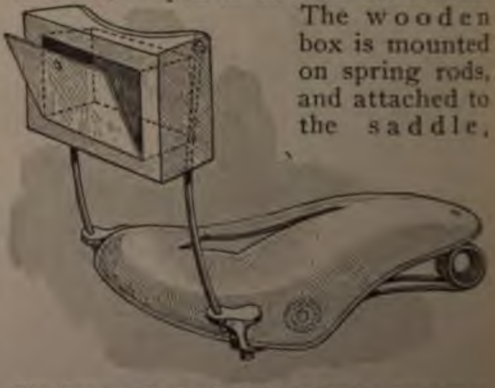
Often a fuse of the ordinary tubular kind, on either house-lighting circuits or automobile wiring, will be found to have blown out, when no new fuse of the proper size is at hand to replace it. In order to avoid interruption of service, or putting the car out of commission, many persons simply twist a piece of copper wire around the terminals on the fuse block, thus leaving the circuit without protection. This might do for an emergency, but is a dangerous practice, chiefly because it tempts one to forget to obtain a new fuse as soon as possible. A better way is to wrap the blown-out fuse with tin foil, such as is used for wrapping chewing gum and tobacco, and insert the fuse as before. If no more tin foil is used than is necessary to fit tightly around the fuse, its electrical conductivity will be low enough to give some degree of protection to the circuit until a new fuse can be obtained.

Using Fountain-Pen Filler to Fill Ruling Pens

A cleaner and quicker method of filling ruling pens than the usual one is as follows: Remove the usual ink-bottle stopper; get a cork to fit the bottle and bore a hole through it, large enough to hold tightly a fountain-pen filler or eye dropper. When necessary to fill the instruments, the ink is drawn up in the filler and applied.

Motorcycle Back Rest to Carry Camera

When carrying on a motorcycle some object, such as a camera, which may be injured by an excessive jar, it will be found useful to have some arrangement by which the vibration due to the engine can be minimized. One motorcyclist did this by building a hollow back rest, as shown in the illustration, thus making the one device serve two purposes. The material used was wood, with some simple upholstery in front, shaped to fit the rider's back. The wooden box is mounted on spring rods, and attached to the saddle, which of course should receive less vibration than any other part of the machine.—John Kakerbeck, New York, New York.

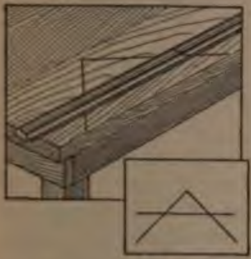


The Camera Carrier is Built in Such a Position as to Form a Back Rest for the Rider

Making Drill Jigs of Cement

Where a number of similar large castings are to be drilled, a cheap and satisfactory jig can often be made of concrete. Steel bushings may be imbedded in it to guide the drills, and handles, hinges, or other parts may be made of steel, as necessary. The concrete may be easily molded into shapes which would be expensive to make of iron.—Irl R. Hicks, Centralia, Ill.

How to Do Miter-Box Work without a Miter Box



When a few miter joints have to be made on screen bead, coves, or other small moldings, and a miter box is not at hand, trouble can be avoided by drawing a straight line on the workbench or sawbuck, with two lines running through it at the 45° angles. Lay the work with one edge along the long line, holding it down with one hand, sight along the saw, and make the cut. On account of the saw being so close to the pencil lines, it is not difficult to keep the saw in alinement.

Converting a Passenger Automobile into Delivery Car

A local garage recenty modified a used five-passenger automobile to meet the needs of a grocer by simple alteratons to the body, without disturbing the gasoline tank or front seat, or altering the chassis. The upholstering and rear seat were removed, and a 2-ft. section of the sheet metal in the back was cut away, down to the car frame. A substantial step of wood, with sheet-iron hangers, was placed at the rear entrance to the car, and a box for needed tools was placed on one running board. With the flooring evened up where the seat was removed, and a guard built in front of the cut-out section of the rear, to keep the merchandise from falling out, the transformed car was of ample capacity, and convenient for the speedy loading up and removal of numerous small packages of groceries. The cost of this job is only a small part of what a delivery-car body would cost, and no expert workman is required to make the change.—G. A. Luers, Washington, District of Columbia.

By Slightly Altering the Body of an Old Touring Car, It was Transformed into a Convenient Delivery Car for a Grocer

Soap Dish Made from End Cap of Roofing Rolls

An excellent soap dish, which costs nothing and can be obtained with scarcely any labor save that of nailing it up, is made from one of the pressed-steel caps with which the ends of rolls of roofing are usually provided. All that is necessary to make it ready for use is to bend over a portion of the rim at right angles to the main part, and to nail this to the wall. In barns, garages, sheds, and many other places, these soap dishes will be found very useful.

The End Cap from a Roll of Roofing Makes an Excellent Soap Dish

Gas Water Heater Controlled by Electricity

The control system for a hot-water heater, shown in Fig. 1, can be made by anyone having a fair knowledge of electrical experimenting, and will save much annoyance. The system makes use of a hot-water tank such as is often built into kitchen ranges, and an ordinary gas water heater. The electrical apparatus consists of four push buttons, two dry cells, a small thermostat, and a gas valve opened and closed by electromagnets. The operation of the valve is shown in detail in Fig. 2. When current flows through the coil at the right, the valve is pulled open. Just before the downward motion of the core inside this coil is completed, however, the circuit through it is broken by the cessation of contact between the long lever and the brass contact spring, so that no current is used except during the actual opening of the valve. The electromagnet at the left in the same way closes the valve whenever current flows through it.

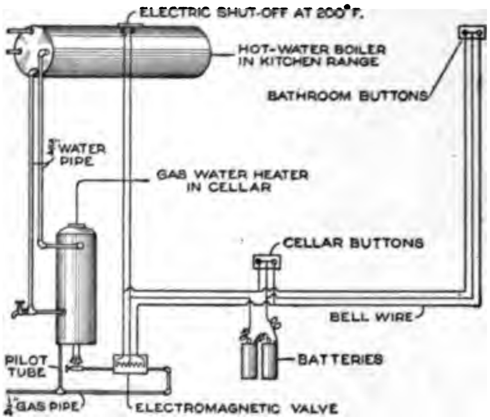


FIG. 1

The Water Heater can be Turned On or Off by Pressing a Button in Any Part of House

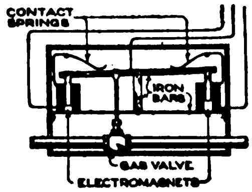


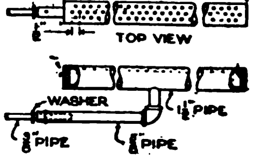
FIG. 2

The two circuits, or three wires, *leading from the* valve, are connected as shown, to buttons, batteries, and thermostat. The buttons may be placed anywhere about the house; any number of pairs of them may be connected in parallel, and the valve operated from any of these points. Pressing the white button opens the valve, and pressing the black one closes it. The thermostat should be set so that it will close the valve-closing circuit automatically if the temperature of the tank is allowed to rise to a dangerous point. A pilot light is kept burning at all times in the heater, just high enough so that the gas from the main pipe will ignite when turned on.

There must be sufficient friction in the valve mechanism to hold the valve closed, or gas may leak into the burners.

Quickly Made Gas Burner for Kitchen Range

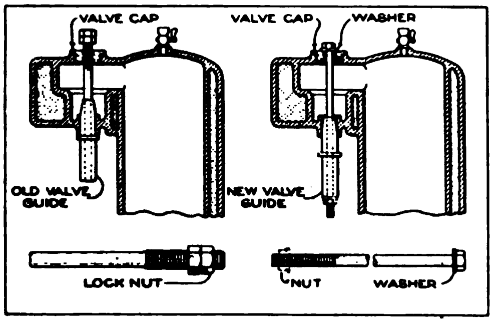
Select a piece of 1½-in. pipe, as long as the fire box of the range, bore and tap a hole for ⅝-in. pipe at the center, as shown in the diagram, and close the ends with caps or by shrinking disks into them. Drill three rows of holes, about 3/32-in. in diameter and about ½ in. apart, in the top side of the 1½-in. pipe. Let the ⅝-in. pipe be long enough to extend from the center of the fire box to the outside of the back of the stove. This burner is to be hung from the grate, while the ⅝-in. feed pipe is to pass through a hole drilled through the back of the ash pit. The small ⅜-in. or ¼-in. pipe is to be inserted into the feed pipe about 2 in.; about 1 in. from the end of each pipe drill a 1/16-in. hole for a pin to hold them together. In the end of the small feed pipe a plug must be inserted, with a hole of proper size, which will be from 1/32 in. to 3/32 in., depending on the quality and pressure of the gas to be used. The mixer is completed by slipping a metal washer over the small feed pipe, to be plac



short distance from the end of the large pipe so as to adjust the flow of air drawn into it. A rubber hose connects the other end of the small feed pipe to the gas cock. This burner has been found to be quite satisfactory. If the fire box is filled with porous fire bricks, a very efficient heating arrangement is the result. Whenever desired, coal or wood may be burned without disturbing the burner, and gas may be used at the same time.

Renewing Valve Guides in Auto Engines

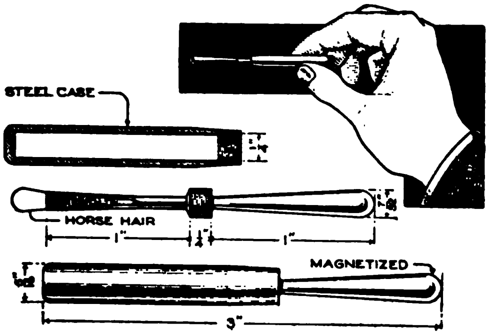
When the valve-guide bushing in the cylinder becomes badly worn and has to be replaced, it is not always desirable to put the car or truck into the repair shop or to tear down the engine to replace it. A handy device for taking out and replacing the worn guide bushing can be made by using a rod threaded at one end to fit the spark-plug thread in the valve cap, and long enough to force the guide out. As the spark-plug thread is standard, the same size rod will do for different engines. To force the worn guide out, screw the rod down by the use of the two lock nuts. To insert the new guide, a bolt is made which will pass down through the guide. The lower end of the bolt is threaded up far enough so that the guide may be forced in place by turning a nut. The head of the bolt, with a flat washer underneath, takes the pressure which is required to force the guide into place.



The Valve Guide is Pressed into or Out of the Cylinder by Turning a Nut

Safety Tool Extracts Particles from the Eye

Mechanics, particularly ironworkers, are continually getting small particles of steel, sawdust, or other substance in their eyes. These foreign bodies are usually removed with a toothpick or match that has been sharpened to a point—a very dangerous instrument in unskilled hands. The illustration shows a safe and convenient instrument for this purpose. It is made of tool steel; the handle end is hardened and magnetized. On the other end a horsehair is securely fastened with a silk thread, which is then given a coat of shellac to prevent the knot from untying. For convenience and protection, the instrument is screwed into a case made of mild steel.



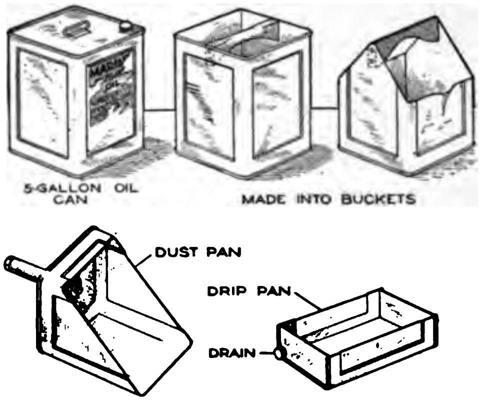
This Easily Made Tool Extracts Particles from the Eye Quickly and Safely

If the particle in the eye is iron or steel, the magnetized end will often remove it. If not, it can be loosened with the horsehair without danger of injuring the eyeball. If, however, the particle is so deeply imbedded that it does not readily respond to either treatment, a surgeon or eye specialist should be consulted immediately; indeed it is best to have medical attention if the wound is at all serious.—M. L. Lowrey, Livermore, Calif.

¶For tables of sufficient size, white porcelain door knobs can be used for sliding casters, by boring out the leg, inserting the stem of the knob, and fastening with a screw through the side.

Making Use of Old Rectangular Oilcans

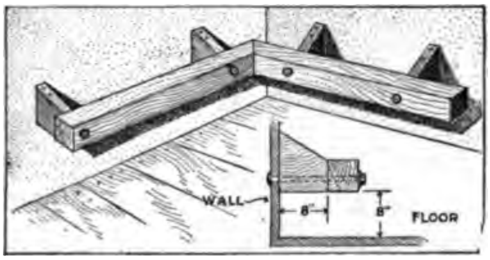
Many handy articles can be easily and quickly made from empty 5-gal. oil tins, as shown herewith. Edges at cuts may be bent over double where desired, to give round edges of greater strength. In drip pans, the screw cap of the can forms a convenient drain.



Cans in Which Lubricating Oil is Shipped can be Made Use of in Various Ways

Railing Protects Young Pigs from being Crushed

Every farrowing pen should have a rail near the wall to prevent the sow from crushing the new-born pigs when she lies down. Planks are often used for this purpose, but a rail is better for the reason that the attendant can help the little fellows out when they get trapped behind the sow. The illustration shows how the rail is held out 8 in. from the wall and 8 in. up from the floor, by brackets. Bolts pass through both the rail, the bracket and the wall. Like all fittings about a hog pen, the rail should be made very strong.—Charles L. Beckwith, New London, Conn.



A Stout Rail about the Hog Pen Protects Young Pigs from being Crushed by the Sow

Steam Jet to Thaw Frozen Water Pipes

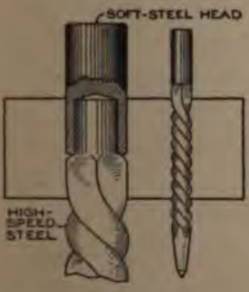
A cold snap which caught New York last winter without sufficient coal to keep warm, played havoc with the plumbing fixtures in all parts of the city. The plumbers were kept busy day and night repairing the burst pipes and thawing out those which had managed to withstand the pressure from within. One plumber in the Brooklyn section speeded up his work by the use of steam from the heating systems for thawing out the frozen pipes. In many instances, it was found that, in order to conserve coal, tenants had shut off the steam on the top floors, leaving them without sufficient heat to keep the plumbing from freezing.

When this was the case, and other conditions permitted, operations were begun by shutting off all the steam radiators in the house except the one in the room where the fixtures were frozen. From this, the air valve was removed, and a short piece of ⅛-in. pipe screwed in its place. A rubber hose of sufficient length to reach to the bathtub and other fixtures was slipped over the iron nipple. Steam, at about 5-lb. pressure, was then turned on all the exposed plumbing fixtures, warming them up sufficiently to melt what ice they contained. Drain traps were thawed by means of the steam, and drained of water. Then the jet was turned into the drain pipe, provision against its return into the room being made by holding wet rags over all openings.

The result was that the whole length of drain pipe extending through the pipe gallery became heated and acted as a radiator, warming up the water pipes within a comparatively short space of time. Usually the cold-water pipe would thaw first, the hot-w pipe giving the greatest troubl such cases, the cold water was often turned off in the cellar, the pipes drained and the steam jet attached to the cold-water faucet in the bathroom. On opening the cold-water faucet in the laundry in the cellar, the steam would soon make its way to this outlet. Again a section of rubber tubing was used, this time to connect the cold-water faucet with the hot-water faucet in the laundry tubs, and so turn the jet of steam in under the ice. The steam was gradually forced to work its way back upstairs by opening the hot-water faucets on the successive floors, closing them as soon as the water was all blown out and steam began to come. It was only in rare cases that the ice resisted this treatment for more than 10 to 15 minutes.—E. F. Hallock, Brooklyn, N. Y.

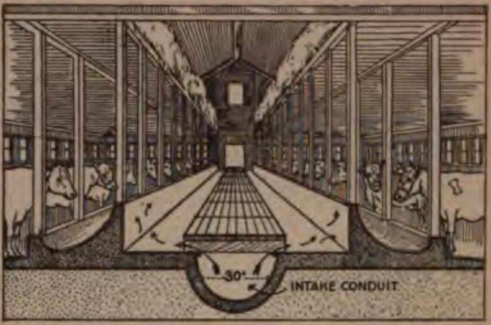
Using High-Speed Steel for Hand Punches

It was found in a machine shop that certain hand punches, broaches, and drifts gave much better service if made of high-speed steel. The objection to this was that they could not be struck with a steel hammer, being so hard that they soon ruined the hammer. Worse yet, particles of the hard steel were continually breaking off, flying with great force, and frequently imbedding themselves in the workman's hands or face. Consequently, copper or brass hammers were used, until the expedient was discovered of grinding the upper end of these tools round, and shrinking on a soft steel cap or head. The cap being of soft steel, an ordinary steel hammer can be used without danger. These tools give long service, and for many classes of work are found to be more economical than the ordinary carbon-steel tools.—M. L. Lawrence, Los Angeles, Calif.



Concrete Ventilating System for Stable

Fresh air may be carried into a cow stable and delivered directly in front of the cows' noses through a concrete conduit under the center feed alley. It must be constructed so as to be easily cleaned, and it must be kept dry.



A Conduit Running the Full Length of the Dairy Barn Provides the Cattle with Fresh Air

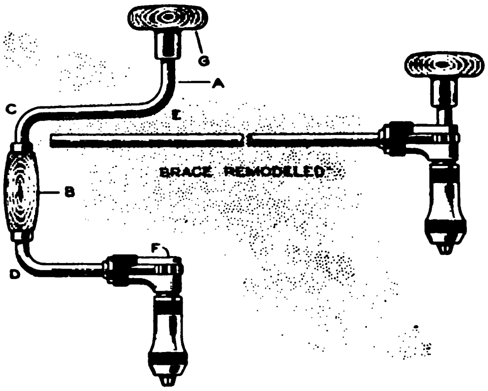
The air flue, shown in the illustration, is 30 in. wide and 30 in. deep, with a curved surface. It is covered with a board walk that extends the whole length of the feed alley. The boards are supported by crosspieces of 2 by 4-in. timber, placed 2 ft. apart, with the ends resting on the edges of the concrete conduit. This leaves an opening for the intake of fresh air, 4 in. high, on each side of the board walk, thus providing about 160 sq. in. of ventilation opening for each cow. Small wooden blocks, nailed to the undersides of the 2 by 4-in. crosspieces, prevent the board walk from slipping down into the air duct. The walk is made in sections, 12 ft. long, and may be laid over against the mangers to give easy access to the conduit at cleaning time.

The amount of air admitted into the conduit is regulated by round wooden dampers that may be operated to close or partly close either end of the conduit, according to the strength or direction of the wind.—H. A. Shearer, Chicago, Ill.

¶Steel running in steel should be hardened; cast iron running in cast iron, or mild steel in mild steel, is bad mechanical practice.

Ratchet Brace Remodeled for Work in Cramped Spaces

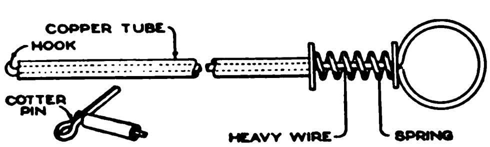
The plan illustrated has been devised to handle the job of boring holes in close quarters, such as between two beams. Any ordinary brace with a ratchet can be adapted as described. The frame is cut with a hacksaw, at A. The wooden grip B is removed, and the corners at C, D, and E are straightened. Next bore a hole at F, in which to fit the short stem GA which was cut off. In operation, pressure is applied at F. On the forward stroke the lever revolves the drill bit, and on the backward stroke it slides with the ratchet.—Frank Barretta, Tenafly, N. J.



By a Few Simple Changes, an Ordinary Ratchet Brace is Converted into One Suitable for Work in "Tight Places"

Holder and Pick-Up Tool for Cotter Pins

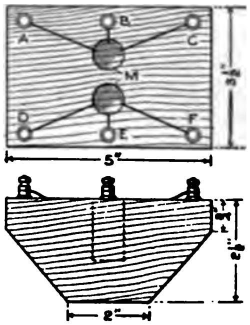
In automobile and tractor work, it is often necessary to insert cotter pins in places where there is scarcely room for a man's hand. The small instrument illustrated has been found very *useful for* this purpose, as it holds the cotter pins firmly, and can be made long enough to reach into the most difficult place. It can also be used to pick up cotter pins or other small objects that have accidentally fallen into the crank case or pan. In using this instrument, place the handle end in the palm of the hand, and take the copper tube between the thumb and first finger. By pulling back on the tube, the instrument is opened to admit the cotter; by releasing it, the cotter is gripped tightly.—M. D. Lawrence, Oakland, California.



A Short Piece of Gasoline-Line Tubing and Some Wire Form a Handy Cotter-Pin Holder

Switch Reversed by Tilting Mercury Cups

Finish a hardwood block, about 2½ by 3½ by 5 in., and bevel the ends as shown in the sketch. The angle of the bevels should allow the switch to rest securely upon either bevel when tilted. Secure binding posts at A, B, C, D, E, and F, and bore two ¾-in. holes, as shown at M, about 1½ in. deep. Pour melted paraffin into the holes M until filled. When cool, trim the paraffin out with a knife, so that the sides and bottoms of the holes are coated with a thin shell of paraffin. This closes the pores of the wood.

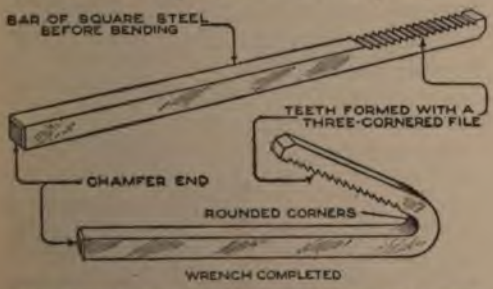


Run iron wires from the binding posts to the holes M, as shown in the sketch. The wires from B and E should reach the bottom of the holes M. The wires from A, C, D, and F should be cut off about ¾ in. from the bottom of the holes M. When the block is placed upon a table in the position shown in the sketch, pour sufficient mercury into the holes M so that the ends of the wires from A, C, D, and F are about ⅛ in. from the surface of the mercury. Pour about ¼ in. of kerosene or machine oil upon the mercury. Now plug up each hol with tightly fitting stoppers to prevent spilling the oil or mercury, should the block be upset by accident. The oil will prevent dangerous sparking if a large amount of current is flowing in the circuit when the switch is opened.

When the switch is tilted to the right, contacts will be made between B and C and E and F. When tilted to the left, A and B and D and E will make contact. When the binding posts A and F are connected to one wire, and C and D to the other, a double-pole reversing switch results. In an emergency the mercury may be replaced by salt water. However, for a permanent switch, mercury is much better.—J. Garrett Kemp, Stillwater, Oklahoma.

One-Piece Pipe Wrench Made from Bar Steel

A pipe wrench which will grip firmly a piece of heavy pipe can be made in an emergency from a single bar of tool steel. Simply anneal the bar, file notches in it with a three-cornered file to form teeth, bend it to an angle about like the one shown, harden the bar, and temper it so that a smooth file will cut the steel just slightly. The length of the toothed portion will depend on what range of pipe sizes is to be handled.—L. M. Hinrichs, St. Louis, Missouri.

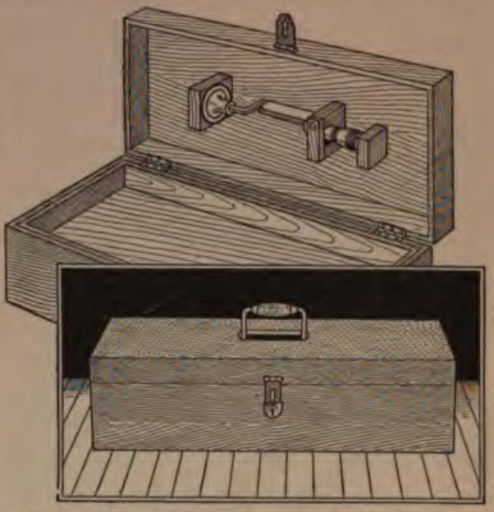

BAR OF SQUARE STEEL BEFORE BENDING
TEETH FORMED WITH A THREE-CORNERED FILE
CHAMFER END
ROUNDED CORNERS
WRENCH COMPLETED

This Pipe Wrench is Quickly Made, and Quite Effective Where Tooth Marks on the Pipe Are Not Objectionable

¶Powdered graphite, shaken up in a squirt can with kerosene, is useful in lubricating the springs of an automobile. The mixture is squirted along the edges of the springs.

Bit Brace Makes Excellent Handle for Tool Box

Every mechanic's tool chest contains a bit brace, and it can readily be kept in the chest in such a way as to form a convenient handle for the chest, which will not wear out or come off. The illustration shows a suggested arrangement. When the brace is to be used, it is withdrawn from the chest by turning the button which holds the chuck in place; the other end of the brace then pulls out of the hollowed-out block of wood in which it rests. —Everett Black, New York, N. Y.



The Bit Brace Which Is Part of Every Mechanic's Equipment Makes a Good Handle for His Tool Chest

Digging Holes in Dry Ground with a Hose

When a small hole must be sunk deeply into dry, sun-baked ground, as for chicken-yard posts, or for goal posts, or backstops, for athletic fields, the best tool is a hose with water at 50-lb. pressure, or more, such as is available in most cities. With a nozzle ¼ in. in diameter, a hole, 6 ft. deep, was dug in three minutes, and only 9 gal. of water were used. For deep holes, the nozzle may be wired to a stick so as to be sure it points straight downward.

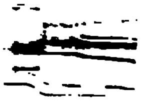
[illegible]

[illegible]

[illegible]

Removing Automobile Wheels [illegible]

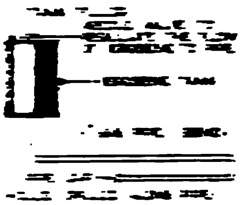
[illegible]



[illegible] or [illegible] is [illegible]

Kerosene Burner or Stove Readily Made

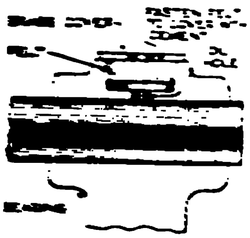
[illegible]



[illegible]

Cover for Oil Holes in Dirty Places

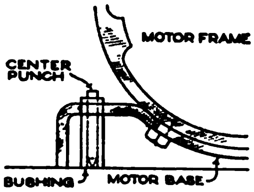
[illegible]



[illegible] In such instances, [illegible] arrangement similar to [illegible] may be used. It [illegible] of a cover of sheet metal [illegible] which is attached [illegible] The felt can be cemented [illegible] disk, which constitutes the [illegible] thick white shellac. If the shellac is too thin, it can be readily thickened by igniting a small portion of it with a lighted match, and thereby burning out some of the alcohol. A cement thus prepared is impervious to oil and ordinary alkalies. The oiler is filled by running oil from the can into the hole in the cover disk, without removing the cover. The oil seeps down through the felt and lubricates the bearing, but dust and grit are excluded. The bearings of a polishing lathe, on which an abrasive dust was used, were equipped as above described, and their operation has been altogether satisfactory.—O. C. Richards, St. Louis, Mo.

Locating Bolt Holes Where Scriber cannot be Used

Where a bolt must pass through two pieces of metal separated by an air space, it is often difficult to mark the location of one hole from the other. In the case illustrated, where the base of a motor was to be bolted down, the mechanic, finding it impossible to use a scriber or a center punch in the ordinary way, turned up a bushing and used a small center punch made of drill rod to locate the center of the hole.—Joe W. Romig, Allentown, Pa.

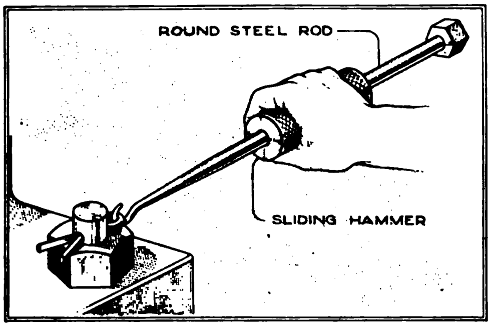


Calculating Belt Lengths for Splicing

When changing machine speeds it becomes necessary to change the length of the belt. To figure how much belting to cut out or add, subtract the diameter of the smaller pulley from that of the larger one, divide by two, and multiply the result by three. This gives the length of the piece to be cut out, or to be added. Stated another way, multiply half the difference in diameters by three. If both pulleys are changed, the rule is applied twice, once for each change. This rule is for open belts, though it is also fairly close for crossed belts.

Cotter-Pin Extractor Has Hammer Built In

This simple tool is a welcome addition to the average mechanic's tool kit.

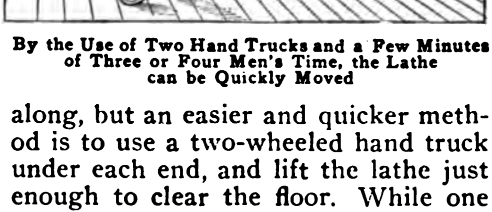


This Cotter-Pin Puller has Its Hammer and Hook Built Permanently Together

It is made from good machine-steel rod, and the hook end is thoroughly casehardened and tempered. If the range of work done is wide, two or three sizes can be made.—Chas. H. Willey, Concord, N. H.

Moving a Lathe Easily with Hand Trucks

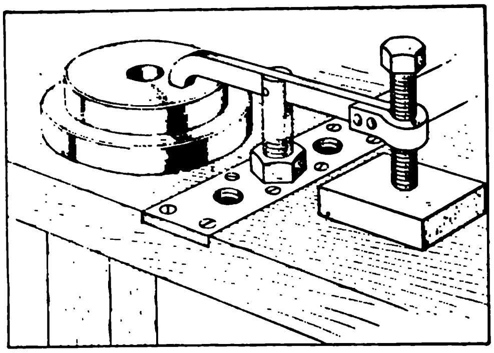
The usual way of moving an engine lathe around the shop is to place planks and pipe rollers under it and shift it along, but an easier and quicker method is to use a two-wheeled hand truck under each end, and lift the lathe just enough to clear the floor. While one or two helpers steady it because of its being top-heavy, it can be wheeled along the floor with scarcely any stops. Progress will be considerably more rapid than when using rollers.—H. S. Rich, Cromwell, Conn.



By the Use of Two Hand Trucks and a Few Minutes of Three or Four Men's Time, the Lathe can be Quickly Moved

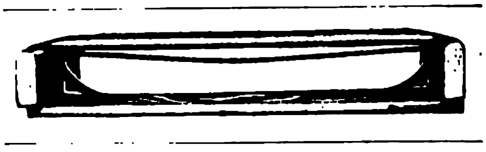
Clamp Holds Work Down on Top of Bench

This simple type of bench clamp, or holdfast, is constructed from stock that can be found around the shop. A 7/8-in. bolt has its head cut off and a slot cut in the body to take the clamping bar, which is made of 3/4 by 3/8-in. stock. One end of the bar is bent around a small rod and riveted; the rod is then removed, and the hole tapped out for a 5/8-in. bolt. A long strip of 1/2 by 1 1/2-in. bar stock, set into the bench and fastened with screws, has holes drilled and tapped at convenient intervals to receive the bench clamp. The long bar may also be placed underneath the bench top, so that screws will not be necessary to take the pull.


This Type of Bench Clamp Is Very Useful for Holding Irregular Objects

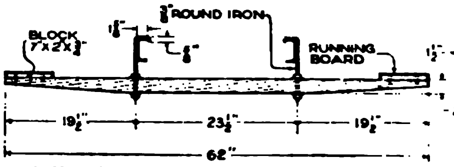
Headrest for Auto Creeper Made from Inner Tube

Creepers with solid cushions usually become covered with dirt and oil that falls down on them when in use under cars. This dirt gets into the worker's hair and scalp, and can only be removed with great difficulty. Old inner tubes are plentiful, and one can be put to good use in making a headrest which is easily cleaned. Two blocks, 6 in. high, form the sides, and a shelf bracket acts as a brace. Stretch the tubes around the frame, and reinforce, if found desirable, by placing a screen-door spring under it.—J. H. Shadek, Oradell, N. J.


An Old Inner Tube Forms a Cushion for a Creeper Which is Easily Cleaned of Grease and Dirt

Running Board on Automobile Strengthened by Brace

Many drivers of light cars load down their running boards with boxes, storage batteries, camping equipment, etc., without much thought of the fact that the running board is not built to take this extra load. It may be readily strengthened, however, by the addition of a brace such as illustrated. The dimensions given are suitable for many light-weight cars, but can be modified when necessary. The brace is hung from the frame of the car, and will help materially where extra loads are carried.—S. J. Forsyth, Syracuse, N. Y.



A Wooden Brace Suspended from the Frame Strengthens the Running Board

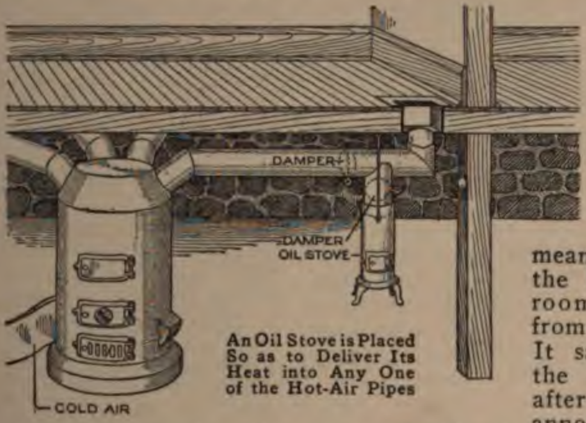
Threading Die Made from a Nut

A nut which has a well-cut thread can be transformed into a die by filing four or five notches in the threads of the nut with a round or three-cornered file, backing off the cutting edges with a larger round file, and then hardening the improvised die. The notches can be cut more effectively with a drill press if one is available; first screw a threaded stud into the nut, and then drill small holes around the circumference of the stud, half in the stud and half in the nut. Remove the stud and touch up the holes with a file. If the stud sticks in the nut, it can be loosened by drilling a hole through its center.—T. T. Smith, St. Louis, Mo.

Auxiliary Oil Burners in a Hot-Air Furnace

By H. E. GIFFORD

MY furnace heated four rooms on the first floor and five rooms on the second floor. Coal was scarce, and had to be obtained in 100-lb. lots, on the go-get-it plan, and drawn on a sled. When the furnace was banked, or kept low, it was impossible to heat all the house. One room on the second floor was rented to a couple, and the wife did not leave her room until noon. It must be without chill from eight o'clock in the morning until then; in the evening the room must be comfortable from 6:30 to 9:30. To place an oil stove in this room meant the burning of unnecessary oil by the occupant of the room, and much running up and downstairs with oil or oil stove; so a plan was contrived to take the chill from the room without building a large furnace fire, or going to the second floor. The same plan remedied the difficulty experienced in heating the parlor on the first floor when the wind was blowing in such a way as to produce this trouble.



An Oil Stove is Placed So as to Deliver Its Heat into Any One of the Hot-Air Pipes

A drop pipe was added to each service pipe of the furnace, with attachments for hooking the oil stove in the bottom of the vertical pipe. A damper was placed in the upper end of this pipe section, to be closed when the oil stove was not burning. In the morning, at the required time, we went to the basement, and, turning the damper, lighted the stove; with the damper in the supply pipe from the furnace closed, the heat from the oil stove heated the room occupied by the couple in a short time. The stove was extinguished at the proper time, and the same plan was followed in the afternoon, and for the parlor when occasion required.

With a low or banked furnace fire, there is very little auxiliary heat required. There is thus an advantage, even in very cold weather, in having a means of regulating the heat of each room, separately, from the basement. It saves running to the rooms to look after the stove and annoying the occupants. Besides, it is much nicer to have the heater removed from sight, instead of in the room where one is sitting.

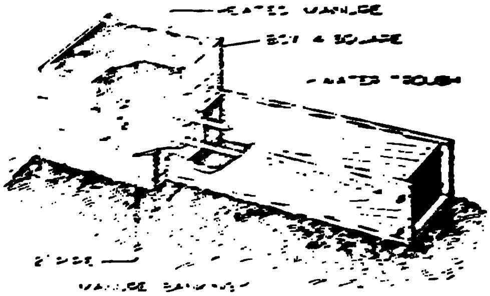
However, the seasons when no fire is kept in the furnace are the best times to feel the great advantage of this plan. One can take the chill from a room at any time, just as though the furnace were working. One may warm any single room, or several, one after another, with the same oil stove; if two or more must be heated at the same time, the same number of oil stoves will be required. Even where there are a number of such rooms, several stoves in the basement will be found more economical than burning coal, as they can be turned off any time.

Where gas is available, especially natu-

[illegible] of course more convenient [illegible] to have permanent [illegible] pipes in every [illegible] and have a gas burner [illegible] gas stoves. [illegible] may still have a permanent [illegible] are used [illegible] used by [illegible] with the ordinary small oil [illegible] around.

Keeping a Water Trough from Freezing

The arrangement [illegible] illustrated will be [illegible] effect in keeping from freezing the water in a trough on the farm. The part of the pipe which is covered with manure is heated, and the water flows upward, cold water being then drawn in through the lower pipe. The effect will of course be much greater if a coil of pipe is imbedded in the manure. It should be placed rather above the center of the manure box, in order to have the greatest heating effect.—R. M. Magnus, International Falls, Minn.



The Water in the Trough is Heated by a Pipe or Coil Imbedded in a Box of Manure, and is Thus Kept from Freezing

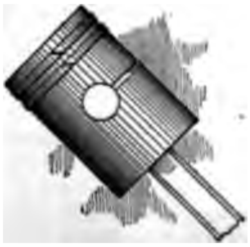
Saving Fuel in the Plant Which Burns Oil

The oil burning steam-heating plant of which I have charge was supposed to be running as economically as was possible in practice. However, when the price of fuel oil began to go up, I saw that it was up to me to do better. Knowing that there was no big waste anywhere, it was obvious that if any saving was to be effected, it must be in little things. Consequently, beginning at the fires, I relined and refloored the furnaces, or fire boxes, under each boiler with fire brick, taking great care to give just the proper amount of air vents in each floor. The water and oil pumps were then thoroughly overhauled; quite a saving was made here, as the pumps could run more slowly when they were in perfect condition. All steam traps were also put in good working order. A coil of pipe was put in the smokestack to superheat the feed water just before it entered the boilers. I also had the boilers cleaned each week instead of every two weeks as formerly.

The big saving, however, was made in the management of the fire itself. In burning fuel oil it is necessary to have the mixture of steam, oil and air exactly right to get perfect combustion. If too much oil is admitted, it not only wastes oil at that time, but it also deposits soot in the boiler tubes, so that even with a perfect fire, after the soot has been deposited, there is a great loss of heat until the tubes are cleaned. The plan by which a nearly perfect fire was secured is this: Each evening, when the fires are put out for the night, I personally inspect each boiler, and whenever soot is found in the tubes I have the fireman brush them. As everyone dislikes this job, it being so hot, dirty, and disagreeable, the firemen soon got to watching the fires much more closely, and, seeing the benefits in personal comfort derived from clean fires, they have now entered into the spirit of the thing, and vie with each other in getting as perfect combustion as possible.

Summing up, as we have reliable data showing our evaporation of water, I can state positively that our saving is at least 4½ per cent, and am quite sure that similar attention to minor things will effect a considerable saving in all steam plants. While apparently the percentage is small, the actual amount of fuel saved is quite large.—M. L. Lowrey, Livermore, Calif.

Lubricating Piston Pins on V-Type Engines

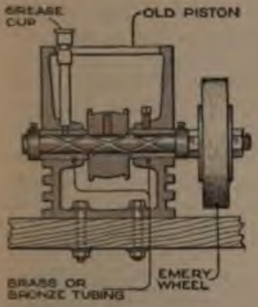


In the modern V-type high-speed engines, where the cylinders are very small, the proper lubrication of the piston pin is a difficult matter and has given considerable trouble, especially with aluminum pistons. Because the cylinders are placed at an angle, the oil is drained to the lower side, and the pin bearing receives less oil than in the vertical types. The bearings are also small, due to the small cylinders, which tends to increase the difficulty of proper lubrication.

This trouble has been overcome, in one of the famous foreign aeroplane engines, in a very simple manner. The same method has since been used on several automobile engines with entire success. A groove is cut from bearing to bearing on the top side of the piston, as shown in the illustration. The oil collects in the groove, and drains into the piston-pin bearings. The depth of the groove in the piston depends upon the thickness of the piston at that point, and care must be taken that the wall is not weakened too much.—S. E. Gibbs, Urbana, Ill.

Bench Grinder or Polishing Head Made from Old Piston

A badly worn piston from an old gas or automobile engine can easily be made into a bench grinder or polisher. The piston-pin bearings are best fitted with a brass or bronze bushing, or a bearing can be poured with babbitt around the shaft. The belt pulley, being placed inside the piston, is surrounded by the piston wall, forming a splendid belt guard. The grease cup, mounted as shown, furnishes lubrication, and the oil or grease should be distributed by means of grooves cut in the shaft. Emery or polishing wheels may be mounted on one or both ends of the shaft, which is held in place by collars with setscrews. The piston may be bolted either to the bench, or to a special stand made for it. The stand should, however, be very stiff to withstand the high speeds at which these tools are run.



Keep the Coal Wet

One way of saving coal, which is widely known but not so widely practiced, is by keeping it wet. It is found by tests, that coal which is kept exposed to the air, loses a considerable percentage of its fuel value by gradual oxidation. This can be eliminated by keeping the coal under water, or it can be reduced very largely by keeping the coal wet.—John J. Spaulding, Zanesville, Ohio.

Moving Heavy Stones into Place on a Wall

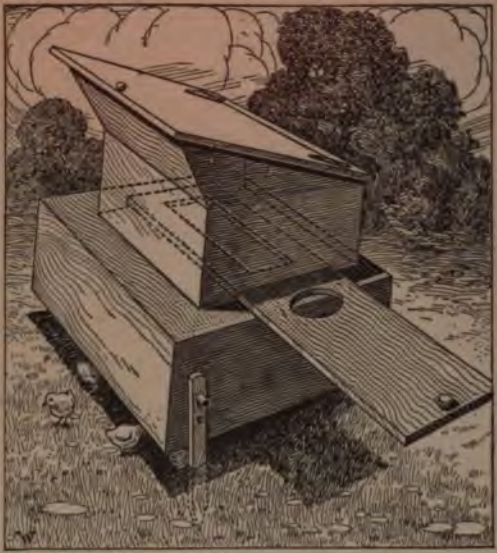
In moving heavy stones to the top of a wall, a low truck or barrow was used on a broad plank, which formed an incline and had at its upper end a groove, in which the upper wheels could rest. The truck, carrying a heavy stone, was pushed up the plank, until the wheels fell into the groove; the handles could then be lifted so as to slide the stone off onto the wall, without danger of sliding back down the incline, and without the necessity of placing any blocks back of the truck wheel. As the placing of such blocks would require the labor of an extra man or boy, considerable expense was saved by this arrangement.—J. G. Allshouse, Vandergrift, Pa.

Wood Box Built into Wall of Kitchen

Carrying wood into the kitchen for use in the range is one of the chores which nearly every farmer's boy dislikes. It is troublesome because doors must be opened and closed while the arms are full, and because it is difficult to keep the wood from striking against objects in the kitchen. A better and cleaner way is shown in the sketch. The wood box is built into the wall; the wood is thrown in from the outside, and can be lifted out by opening another door on the inside. The outer door should be fitted quite closely, and may be packed with felt, or several thicknesses of cloth, in order to keep out the cold air. The "dead air" in the wood box will then form a good heat insulator.—P. T. Hines, Raleigh, N. C.

Poultry Feeder Places Food for Chicks Out of Hens' Reach

The chicken feeder here shown is designed to place the proper amount of grain within reach of the young chicks, but out of reach of the hens. A box, in the bottom of which a slot, several inches wide, has been made, is inverted and fastened to stakes driven in the ground, so that one edge stands just high enough to permit the chicks to pass underneath. The bin placed on top is made from another box, and may have one edge flared out as shown, so that the grain can be dumped in with less danger of spilling. The slot in the roof of the lower box is covered by a board twice as long as the box, with a round hole at its center. This board slides back and forth endways, the ends of the bin being cut out to fit it. Each time it is shifted over, some grain is permitted to fall through onto the ground. This amount can be adjusted after some experience by changing the speed at which the board is shifted.



The Edge of the Box Is Just High Enough to Give Access for the Small Chicks, While Excluding the Hen. Shifting the Board Drops a Supply of Grain to the Ground

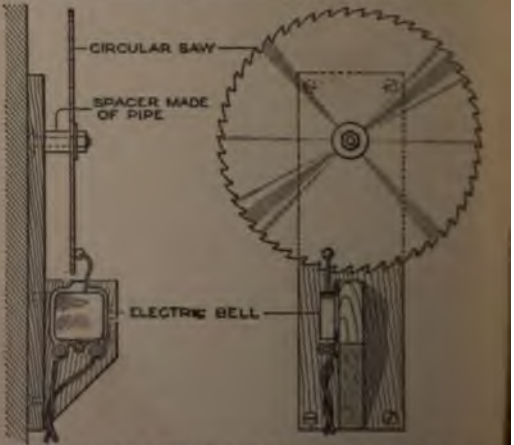
The bin is provided with a hinged cover, so that all grain except that which has been dropped on the ground is protected from the weather. At night, or in rainy weather, if the pegs are removed from the stakes and the box dropped to the ground, the grain remaining will be protected from getting wet or from the ravages of small prowlers.—F. W. Vroom, East Lynn, Mass.

Thermometers Save Coal in Small Plant

In a small manufacturing plant it was the night watchman's duty to fire the boiler and keep the place heated; in order to be sure not to have any freeze-ups, he kept up more steam than was actually needed. To overcome this we placed a thermometer at each station where the watchman had to stop when making his rounds, so that he could see the actual temperatures, and keep the various departments properly heated without waste. This eliminated guesswork, and as he did not have to fire his boiler so often, he saved time, labor, and an amount of coal that paid, many times over, the cost of the thermometers. In many small plants, the only places where a thermometer can be found are the boiler and engine room, and possibly the office. In the home also, a small investment in thermometers will pay good dividends in coal saved.—M. Bush, Bloomfield, N. J.

Discarded Circular Saw Forms Loud Bell for Use in Shop

A shop, which needed a loud bell for signaling, and possessed some old worn-out circular saws, made use of the combination of circumstances by rigging up the bell illustrated. A rather powerful electric bell furnished the tapper and the magnet, while one of the saws was mounted on a bolt through the center hole, to be struck by the tapper. The result was a sound which could be heard above the noise of the shop machinery.



A Circular Saw Which had Outlived Its Usefulness as a Cutting Tool was Made to Do Service as a Powerful Noise Maker by Combining It with the Mechanism of an Electric Bell

Automobile-Exhaust Heater Mounted in Floor Register

By C. C. SPREEN

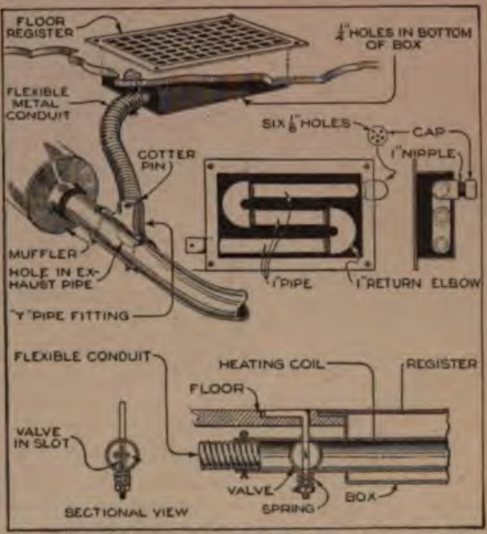
HEATERS for automobiles are made in various ways, most of them utilizing the heat of the exhaust, since this heat is otherwise wasted, and can readily be piped to some form of radiator. Notwithstanding the apparent simplicity of such systems, the manufactured ones are often fairly expensive, and their installation is none too simple.

On most cars it is possible to cut a rectangular hole in the floor boards and install a small register, such as is used with hot-air furnaces. A radiator can be built into the register, as illustrated. The exhaust end of the radiator is plugged with a nipple and pipe cap, a number of small holes being drilled in the cap to enable the gas to escape after having done its work. At the intake end of the radiator, some form of low-pressure valve should be placed. In the one illustrated, a ⅜-in. steel rod is bent to form a lever at the upper end, the lower end projecting through the pipe and carrying a nut and a spring to keep the proper tension. The valve consists of two thin steel disks with an asbestos disk between them, and is fastened with a cotter pin in a slot sawed in the ⅜-in. rod. The asbestos disk is slightly larger than the steel disk. While such a valve, of course, is not able to withstand any considerable pressure, it will close the pipe nicely in an installation such as this one.

A cotter pin is placed through the rod, just above the pipe, to take the thrust of the spring and hold the valve in proper position. The bent upper end of the rod may be sunk into the floor, where it will be out of the way but easily turned by a touch of the driver's heel.

The exhaust gas is taken from the main exhaust pipe through a flexible metal conduit, one end of which is fastened into the radiator pipe with a cotter pin, and the other similarly fastened into a lateral, or "Y," pipe fitting. This fitting may be bolted around the exhaust pipe, one side of it being cut out so that it can be slipped over the pipe, in case the exhaust pipe is so arranged that the fitting cannot be readily slipped over its end. A hole is made in one side of the exhaust pipe where the "Y" is to come.

The heating efficiency will undoubtedly be higher if the exhaust pipe is tapped between the engine and the muffler; this may, however, involve some possibility of a noisy exhaust through the radiator. Installing the Y-fitting beyond the muffler has the additional advantage that less dirt will enter the radiator, and that the possibility of its becoming overheated from badly timed engine valves is almost eliminated.

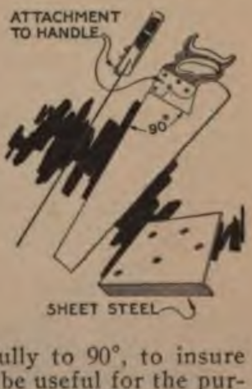


A Radiator Built of Iron Pipe, Fitted into a Floor Register and Heated by the Exhaust from the Engine, Overcomes Largely the Discomforts of Winter Automobile Driving

---

Handsaw Fitted with Attachment for Use as Square

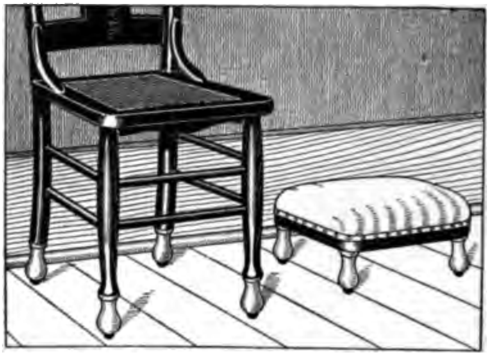
A small fitting for a handsaw, that will not affect its use for ordinary purposes, but will add to the general utility of the tool, especially for quick, or rough work, is a square fitted to the handle. The attachment is made of sheet steel, shaped as shown, and drilled for fastening to the wooden handle. The adjustment should be made very carefully to 90°, to insure that the square will be useful for the purpose intended. The practical features of this kink will be readily appreciated by mechanics.



¶ Pulverized asbestos and plaster of Paris in equal parts by weight, and water sufficient to make a soft paste, make an effective asbestos cement.

Base Knobs or Door Bumpers Put to Various Uses

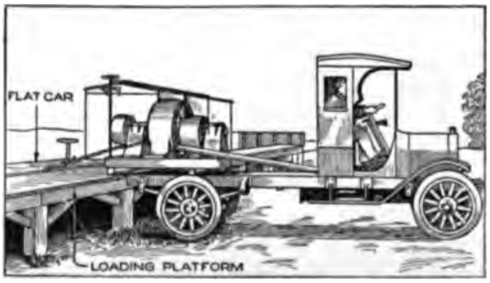
Base knobs, which may be purchased for from 2 to 10 cents each, may be used for many purposes besides acting as door stops. An ordinary chair may be made higher for a child's use by simply screwing a knob into the leg of each chair. A novel footrest may be made from the top of a discarded organ stool by screwing four of these knobs into the underside. Small tables may also be made higher by this means.—Mrs. Grace E. Willey, Concord, N. H.



Base Knobs, Such as are Placed behind Doors to Keep Them from Marring Woodwork, Are Useful for Purposes Such as These

Unloading a Heavy Machine from a Truck

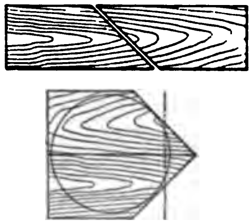
A man who had the job of unloading heavy machines from a truck was confronted by the shortage of labor, and employed a method which made use of the power of the truck for moving machines. On backing the truck up against the loading platform, the machine was moved by means of levers, so that the base of it projected about 10 in. from the rear end of the truck. It was raised slightly, so that a roller could be placed under it. While a rope and hook then held the machine from moving, the truck was moved forward a short distance, under its own power. It was then gently backed against the platform again, the machine thus moving farther onto the platform, and enabling more rollers to be placed under it. With the rope shortened, the operation was repeated, until the machine rested entirely on rollers on the platform. By means of a pole, the machine was then pushed, a short distance at a time, onto the flat car beyond the loading platform. The process should be attempted only by a truck driver who is thoroughly familiar with the clutch action of his truck, as too great a movement of the truck might easily prove disastrous to the load.



By Moving a Truck Forward and Back under Its Own Power, Heavy Machines are Unloaded from It on Rollers, and Pushed onto Flat Cars

Lumber-Saving Kink for Making Split Patterns

To make a circular, split pattern, it was necessary to cut two semicircular pieces of wood. A piece of material was found which was suitable, except that it was not quite twice as long as the diameter of the circle. The diagram shows how this stick was nevertheless used, by sawing it at an angle. The dotted line shows how much too short the stick would have been if it had been cut at right angles.—C. W. Thunen, Benicia, Calif.



Extinguishing Spontaneous Fire in a Coal Pile

A large pile of coal was found to be on fire, due to spontaneous combustion. A hose and water pressure were available, but it was found difficult to make the water penetrate deeply into the burning coal. The difficulty was overcome by attaching to the end of the hose a 10-ft. length of 1-in. iron pipe. The other end of the pipe was thrust into the pile as far as possible, and the water turned on. As the coal directly in front of the pipe was gradually forced away by the water pressure, the pipe was thrust farther in. Occasionally a large lump was encountered, which would have to be broken by blows of the pipe itself acting as a hammer, or of a heavy hammer applied to it. After driving several holes into the interior of the coal pile in this way, the fire was found to be extinguished.—Maury Robinson, Paris, Tex.

Sheet-Metal Backing Helps When Sawing Softer Materials

When attempting to cut a very brittle piece of hard rubber, fiber, or asbestos sheeting with a hacksaw, especially if only a small vise is available for holding the work, it is well to clamp the material between two sheets of tin or other thin material. The resulting cut will be true, smooth, and firm-edged. This is particularly helpful in the case of cutting materials such as asbestos.

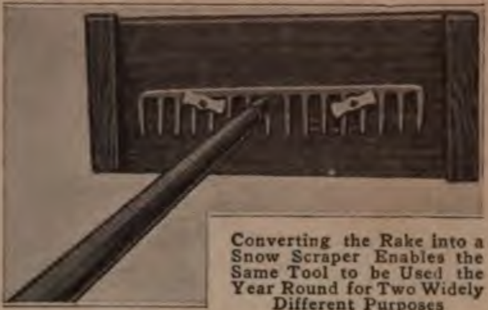
Dissolving Boiler Scale Saves Fuel and Provides More Heat

One means of saving coal, which is applicable to any hot-water heater or steam boiler where hard water is used, is that of keeping the boiler clear of scale so that the heat can reach the water, instead of being wasted to a large extent in the chimney gases. When starting a fire, if a small can of potash, dissolved in about a gallon of water, is poured into the boiler, it will help greatly to loosen the scale as the fire starts to burn. After the system has become thoroughly heated up, the fire should be allowed to die out and the boiler to cool down. The water is then drawn off, carrying with it the scale which has been removed, and the boiler is filled with fresh water and is then ready for service. It should be remembered, however, that there are many kinds of boiler scale, depending on the composition of the water used, so that the efficacy of this method in any particular boiler can only be ascertained by trial.

Other kinks which should be remembered are to keep the flues clean by frequent attention to them, and not to shake the fire too hard, as this often causes coals which are only partly burned to fall through into the ashes.—F. H. Sidney, Wakefield, Mass.

Snow Scraper Made from Rake

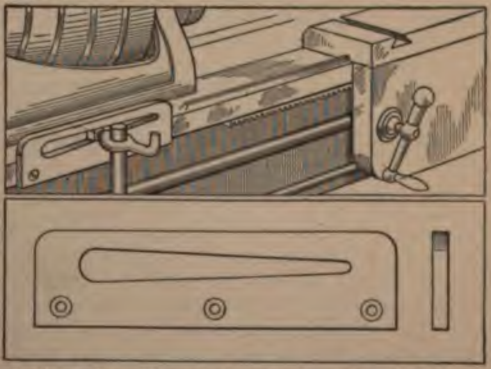
A rake in wintertime is almost as useless as a snow scraper in summer; therefore a device which enables the rake to be converted into a snow scraper will practically make two tools out of one. This is easily done by getting a 1-in. board, about 9 by 18 in. in size, and fastening it onto the rake by some such means as is shown in the photograph. Strips should be nailed across the ends of the board to strengthen it. For light snowfalls especially, the tool will be found even more useful than the ordinary snow shovel.—J. H. Shadek, Oradell, N. J.


Converting the Rake into a Snow Scraper Enables the Same Tool to be Used the Year Round for Two Widely Different Purposes

Wrench for Setscrews in Dogs Attached to Lathe

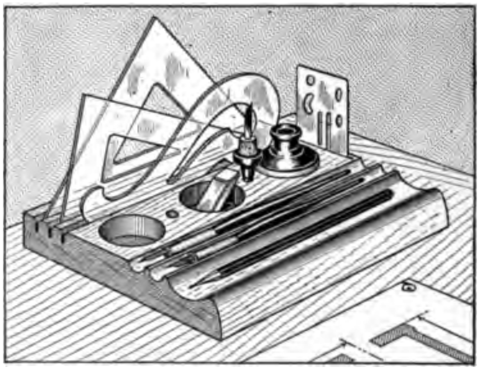
A simple addition to the bed of a lathe will save time for workers who have frequent use for dogs of various sizes. In using this form of wrench, instead of holding the work in one hand with the dog attached, and tightening or loosening the screws with a wrench held in the other hand, the work itself forms the wrench, and the setscrew head is inserted in the tapered slot which grips it like a vise.

The advantages of this form of wrench are, of course, that it is always handy and never gets lost, that it takes all ordinary sizes of setscrew heads used on lathe dogs, and that the operation of tightening or loosening the dog requires fewer operations, and therefore less time when this form of wrench is provided.


A Sheet-Iron Wrench Attached to the Lathe Bed Saves Time in Loosening and Tightening Setscrews in Lathe Dogs

Handy Rack Holds Draftsman's Tools

A rack, which will keep most of the draftsman's tools safe from being pushed off the table, is easily made from a single block of wood. The work will, however, be much easier if a buzz saw and some large auger bits, or an expansion bit, are available. The size of the block can be varied to take different combinations of triangles, ink bottles, etc. In the rack shown, the three circular holes are suitable either for a bottle of ink, or for holding such small objects as erasers, extra leads, or thumb tacks. Small holes beside these are made to hold the ink-bottle stoppers. Any number of semicircular grooves can be made in front; if red and black ink, for instance, are both used, one groove may be painted black and the black penholder used in black ink may be kept in it, another groove being similarly painted red for the red pen. —D. D. Symmes, West Haven, Conn.



The Draftsman Who Keeps His Tools in a Rack will Have Less Trouble in Finding Them and More Room on His Table

Building Heavy Doors in Place Saves Trouble of Hanging

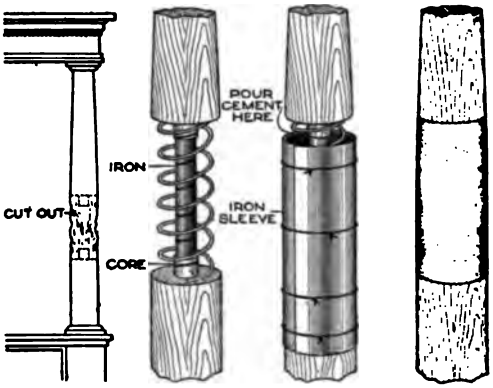
When heavy barn or outbuilding doors are to be hung, many farmers build the doors complete and then hang them. It is thus often difficult to prevent sagging while mounting the hinges. A better way is to nail in place the frame for the door, the nails being driven in only part way. The door planks are then cut and fitted in place, as though they were to be a stationary part of the structure. Sufficient space must, of course, be left around the door openings so that it will swing freely. When all the door planks are in place, the hinges are attached, and the nails holding the frame in place are drawn out, allowing the door to swing free. Double doors may be built in one piece, and sawed in two in the middle after the whole door is completed.

Small Piece of Glass Is Useful in Tool Grinding

When grinding a tool to a master gauge or template, or to cut a standard thread, lay on the tool a small piece of window glass, and place the gauge flat against the other side of the glass. A piece of glass, 1 by 2 in., is a great convenience in a mechanic's tool box. To prevent cutting of the fingers, the edges may be smoothed down with a whetstone.

Repairing a Pillar with Cement

A wooden porch pillar, which has rotted out at one point, may be repaired at a very slight cost, as shown in the sketch. First cut out the rotted portion, leaving projections on both ends at the center of the pillar, as shown. Cut a piece of iron pipe, just long enough to drive in between the two pieces, and wind some stout wire around to act as reinforcement. Then bind a piece of sheet iron around the lower segment, extending up to within about 2 in. of the upper segment, leaving enough space for pouring cement. Line up the top of the sheet iron with the surface of the upper part of the pillar, and pour full of cement. After the cement has dried for about three days, remove the sheet iron, fill the gap with cement, and trim up defects. If the repaired post is repainted, the joints will be scarcely noticeable.—E. Stumpf, Jersey City, N. J.



A Wooden Pillar Which has Begun to Rot can be Repaired Quite Satisfactorily by Means of a Piece of Pipe, Covered with Cement

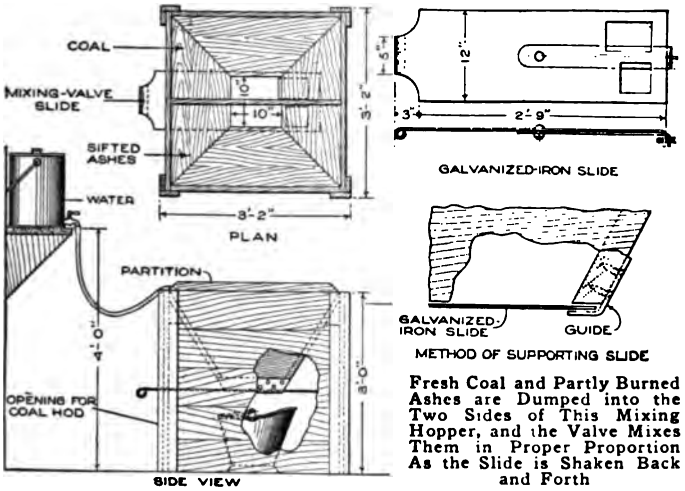
Save Coal by Burning Ashes

By P. P. AVERY

IT is quite well known that when fresh coal exclusively is burned in a large stove or furnace, the ashes which are shaken down nearly always contain a considerable proportion of unburned coal or coke. Anyone who is careful of the amount of coal he uses must take some means of recovering the good coal from the ashes, and burning it over again. To do this, it must be mixed with fresh coal, and mixing it in the proper proportion with a shovel, or with several coal hods, is sometimes a job which is so tedious as to be frequently neglected, sometimes to the extent of even wasting the partly burned coal.

With this in view, a mixing hopper was constructed in an old wooden box. The bottom of the hopper is made to come about 13 in. from the floor, so that a coal hod can be set under it; this bottom consists of a valve, or slide, made of heavy galvanized iron. In it are two rectangular holes, one for each of the two halves into which the hopper is divided by a wooden partition. One of these openings is made 50 per cent larger than the other one, because it is necessary for best results to have a rather greater volume of fresh coal than of the partly burned coke. The back end of the iron slide is bent down slightly, in order to prevent it from slipping out from the two guides which support it at the sides, and the front end is shaped to form a handle, either by bending it over, as shown, or by cutting out a hole to fit the hand. Underneath this part, the front side of the box is cut out large enough to permit the coal hod to be pushed in. It is better not to have any more of the box open than just what is necessary in order to insert the coal hod, because the sides of the box are effective in keeping the dust confined.

In using the hopper, the coal is dumped or shoveled into one side, and the ashes, thoroughly sifted and cleared of clinkers, are thrown into the other side. With the empty coal hod standing underneath, the valve is pulled out and pushed back several times, or until the coal hod is full. The fuel will be thoroughly mixed, in the proportion which is fixed approximately by the relative size of the two openings in the slide. The exact size of these openings will, of course, depend somewhat on the kind of fuel burned. It will therefore be advisable at first to cut the larger of these openings slightly smaller than the half of the hopper bottom, so that either opening can be enlarged if the mixture is not just right. If still more accurate results are wanted, it is entirely possible to attach to the bottom of the slide a strip of iron which swings on a pin, as shown in the detail, so that a slight change in its position increases the size of one opening and decreases the size of the other.



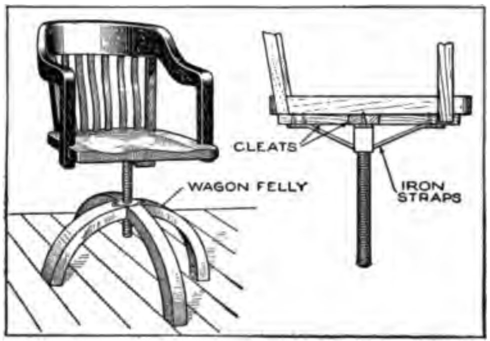
Fresh Coal and Partly Burned Ashes are Dumped into the Two Sides of This Mixing Hopper, and the Valve Mixes Them in Proper Proportion As the Slide is Shaken Back and Forth

A good deal will depend, of course, on the skill developed in using the mixing hopper, as, for instance, the handling of the slide. The mixing will be much more thorough if the slide is kept in motion, by shaking it back and forth while the fuel is falling through. Better results will often be obtained by sprinkling the ashes with water; a 5-gal. oil or gasoline can filled with water can be mounted on a shelf near the hopper, and a rubber hose then makes this sprinkling very easy. The partition should be built a few inches higher than the sides of the box, so as to make it less likely that stray lumps of fuel will fall into the wrong side of the hopper. By this thorough mixing, in the proper proportion, of fresh coal and partly burned ashes, the weekly coal consumption of an ordinary kitchen range, carefully measured, was reduced from 14½ hods a week to 10 hods, the amou of cooking and heating being the s

The mixture is especially useful for banked fires in cold weather, which need not be very hot, but must last through the night.

Swivel Chair Made from Wagon-Wheel Fellies

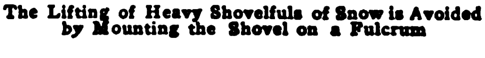
A useful and not ungraceful swivel chair was made by removing the broken legs of an old chair and mounting the good portion on a base made from two pieces of wagon-wheel fellies. An iron bar, 1 in. in diameter, was threaded and made to work easily through a threaded hole in the fellies, strengthened by the addition of a metal blade on top. On the bottom of the chair seat, two wooden strips were fastened with screws, at right angles to each other, crossing in the center. The end of the iron rod, sharpened to a square point, was driven into a tapered hole in this center, and was braced by two iron strips, tapped out to take the thread on the bar, screwed into position as shown, and fastened with screws.—Charles Black, Jr., Hightstown, N. J.



After Having a Leg Broken, This Chair was Converted into a Swivel Chair by Mounting It on Two Pieces of the Felly of a Wagon Wheel

Lever-and-Fulcrum Snow Shovel Makes Heavy Shoveling Easy

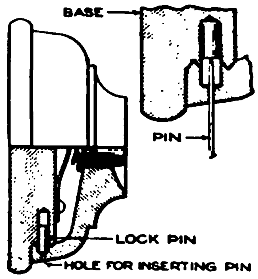
For heavy snowfalls a hand-derrick shovel gives the user a great advantage over the old-style shovel. Simply mount on a sled an upright frame made of 2 by 4-in. lumber; upon this as a pivot, a pair of handles is bolted, to which is attached an ordinary shovel. The upright frame is 24 in. high, and it also swings, on the two bolts at the bottom. The width of the sled is 12 in. The sled is made of two pieces of 2 by 4-in. timber, with lighter pieces nailed across. The handles are 5 ft. long, or more; three braces hold them secure for heavy lifting. Large screws fasten the handles to the triangular-shaped pieces, and bolts hold the shovel to the handles. At the rear the handles are 2 ft. apart and taper to 3 in. apart in front.—F. E. Brimmer, Dalton, New York.



The Lifting of Heavy Shovelfuls of Snow is Avoided by Mounting the Shovel on a Fulcrum

Push Button Locked against Interference by Children

Many small boys take pleasure in unscrewing covers from electric push buttons, often losing or disconnecting parts of them. The illustration shows how they may be protected against interference by anyone who does not understand the method of opening them. Unscrew the cover or cap, and determine the thickness of the base, which carries the thread; then replace the cap and bore a hole, just large enough to take an ordinary brass pin, through the cover and the base. Unscrew the cover, and enlarge the inner part of the hole, in both base and cover, so as to take a lock pin made of wire, about ⅛ in. in diameter. The lock pin should work quite freely in this hole. Now insert the lock pin in the base and hold it in place with a piece of paper or a key, until the cover is screwed on. After the cover is screwed clear into place, the lock pin will drop, preventing the cover from again being removed until the lock pin is released by upward pressure of a common pin through the small hole.



Renewing Old Electricians' Tape

Electricians' tape which has been used, or has dried, can have its stickiness restored by immersing in strong hot soapsuds, and leaving until the solution has penetrated. It is then taken out and hung up to dry, being rolled up as soon as it reaches the required stage of "stickiness."—Fred C. David, St. Joseph, Mo.

Using Soft-Coal Screenings with Anthracite

The following idea may be of benefit to many householders who have only a small amount of anthracite on hand:

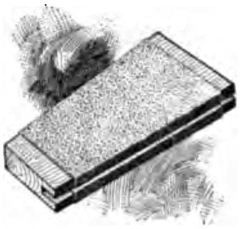
First, secure a load or two of soft-coal screenings, No. 1 grade if possible. Second, sift all the refuse from cooking stove and furnace, and after picking out the slate and clinkers, mix an equal amount of the screenings with the sifted cinders (not the fine ash), and use the mixture in the furnace. If the soft coal is a noncaking fuel, it will neither harden over nor clinker, and practically all the anthracite as well as the screenings will be consumed; furthermore it will give a lasting fire.

Using cinders alone with anthracite makes a dirty fire with lots of clinkers, and I have found from experience that when cinders are used with anthracite alone, it requires quite a few siftings to consume even the first cinders used. No doubt this is the reason for the great waste of cinders in private houses. The mixture of cinders and screenings makes a great deal less smoke than the best grade of soft-coal lump. This is no doubt due to the fact that the anthracite cinders are of practically the same composition as coke; that is to say, nearly pure carbon.—James E. Noble, Portsmouth, Ont.

Breastplate for Brace and Bit

When using a brace and bit, or a hand drill, on a job which requires considerable pressure, a large surface by which the pressure can be applied will make the job much easier. The end of a common tin can, nailed to a round wooden disk about 10 in. in diameter, forms a handy device for this purpose. By placing the end of the brace inside of the can and the disk against the operator's body, considerable pressure is applied quite easily.—A. M. Fairfield, St. Marys, Kan.

Sandpaper Held Firmly on Block by Its Tapered Shape



A neat form of sandpaper block has its two sides slightly out of parallel, one of them having a slot into which the edges of the piece of sandpaper are folded. The paper will be clamped quite tightly by pushing it toward the larger end of the block, or instantly released by pulling it toward the small end. In using the block, if it is held with the small end toward the workman, the index finger resting on the large end, there will be no tendency of the paper to slip out of place. Blocks embodying this principle can, of course, be made of various shapes, and with corners curved off to any radius to fit fillets in the wood to be sanded.—Henry Wedde, Chicago, Illinois.

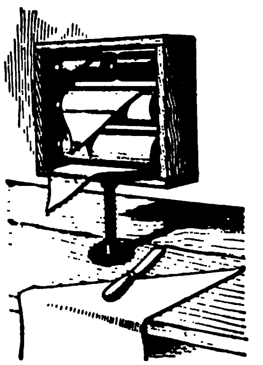
Using a Barrel as a Mouse Trap

When difficulty is encountered in ridding a place of mice by the ordinary methods, try this one: Get a fairly tight barrel and bore a hole near the bottom to serve as an entrance. Throw into the barrel a quantity of shavings, or any material that would be useful to the mice in forming nests. Add some grain to serve as an additional attraction, and then cover with a piece of wood. Let the barrel remain in a place infested with mice for a week or ten days. At the end of this time numbers of the creatures will have taken up their abode in the barrel, and be busy nest making. Then stop up the hole in the bottom with a cork or wood plug of proper size, lift up the cover of the barrel a little, and pour in water until there is sufficient to drown the occupants. The trap may be emptied and, after drying, set up again. In this way a locality is soon cleared of mice.—S. Leonard Bastin, Bournemouth, Eng.

Pinch Bar Made from Buggy Axle

When an old buggy is thrown on the scrap heap, its axle can be made by any blacksmith into a handy and durable pinch bar or crowbar. The size and weight of the axle make it well adapted to this purpose.

Convenient Rack for Rubber Gum and Fabric

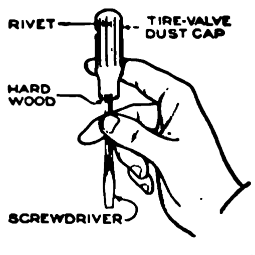


Vulcanizers will find this rack convenient and practical. It keeps the repair stock clean, and permits several men to work at the same table without interfering with each other. The wooden frame, made to hold several rolls of gum and fabric, revolves on a stand fastened to the table. It can be turned in any direction, to accommodate workmen at the opposite ends of the table.

The frame is of lumber, 4 in. wide, with holes bored through the sides to hold the rolls. The rack revolves on a piece of half-inch pipe, threaded on one end to fit a flange, which is screwed to the center of the table. On the bottom of the rack another flange is screwed, in which the pipe should turn easily.

On the ends of the rack may be hung knives, rollers, stitchers, scissors, etc., thus keeping the table clear of working tools and allowing more table space. The entire contrivance is so simple that any vulcanizer can easily construct one.

Screwdriver Handle Made of Dust Cap from Tire Valve

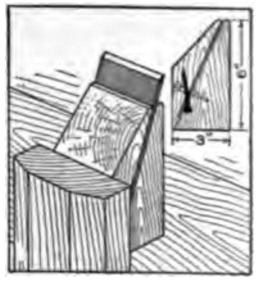


An ideal screwdriver handle is made from an old dust cap, such as used on automobile tire valves. A piece of hard wood is driven into the cap as tightly as possible, a rivet is then driven through, near the upper end, to prevent the wood from turning in the cap, and a hole is drilled in the wood at the open end, somewhat smaller than the round rod which forms the blade. The latter, which may be a piece of drill rod ⅛ to $\frac{3}{16}$ in. in diameter, should be beveled off to a chisel edge, driven into the handle, and then ground to the proper shape for use as a screwdriver. The dust cap forms a durable handle and ferrule in one piece, and has the additional advantage that it is .of distinctive appearance, and is so made that a very firm grip can be taken upon it with the hand.

Partitioning Off a Room to Save Heat and Coal

In very cold weather, it may help greatly to save coal if the expedient is adopted of hanging curtains across a large room, so as to confine the heat of the stove or radiator to the part of the room actually required for use. The curtains may consist of blankets hung on a wire. A space of, say, two feet may be left between them and the ceiling for ventilation, without impairing greatly the efficiency as a coal saver.—Eric Warren, Corpus Christi, Tex.

Clamping Block for Filing Scraper Blades



Scraper blades are awkward to file, unless a special vise adapted for such work is at hand. If merely put into the ordinary vise it is necessary to let the blade stick out so far, in order to permit the file to be worked at the proper angle, that the blade bends at every stroke. This is not much bettered even by supporting it by one or two pieces of board, for though the blade then does not bend, the operation of clamping is made awkward, and the blade is still in a vertical position, which lends itself badly to the filing of a bevel.

The filing block shown in the illustration, made in a few minutes from scraps, grasps the blade firmly just back of the cutting edge and holds it in an inclined position which makes it possible to hold the file level. It is made by simply ripping diagonally a block of 3 by 4-in. stock, beveling off the upper portion of the front piece, as shown, and connecting the two by countersunk screws, placed near the bottom end, which are screwed in tight enough to hold the scraper blade while filing.—Henry Simon, Laguna Beach, Calif.

Keeping Collapsible Tubes Inverted Prevents Contents Drying Out

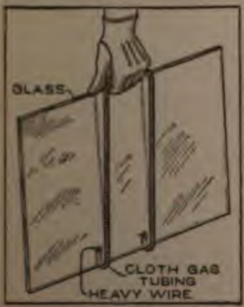
Paint, tooth paste, or other materials kept in collapsible tubes, will sometimes separate, and the oil will squeeze from the tube first, leaving the remaining substance dry. After each time of using, it will be more dry than before, and the last of it may be too dry to be squeezed from the tube. This occurs because the solid matter sinks to the bottom, and may be remedied by keeping the tube in an inverted position. To facilitate this, make a small hole in a wooden block, into which the cap of the tube can be pressed, the block serving as a base or holder for the tube. If the cap is sufficiently tight in the block, the latter will also be of use in unscrewing the cap.

Making Special Angles and Curves for Drafting Jobs

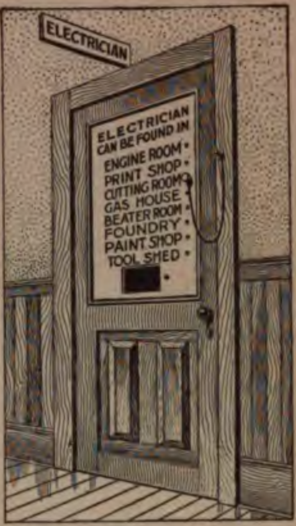
Draftsmen who often have occasion to draw certain curves or angles will save time and work by cutting their own irregular curves and angles out of sheet celluloid, fiber, or hard rubber, using a pattern of heavy paper pasted to the material as a guide, cutting with a scroll saw, and smoothing the edges with a fine file. Often a standard angle or curve can be altered very easily to the required pattern. —J. Horace Van Nice, Chicago, Ill.

A Handy Wire Hook for Carrying Window Panes

Carrying a pane of glass is a job which, although apparently easy, causes much loss of temper. If the pane is wrapped with paper, there is often danger that it will slip out of the hand and fall. If it is not wrapped, the edges are likely to cut the hand. One who provides himself with an old glove, and a piece of stiff wire inside of a long, heavy cloth-covered rubber tubing, will find the difficulty practically solved. The wire is used as shown in the illustration, and the glass is held from tipping out by a slight pressure of the thumb.—Henry W. Kingston, Milwaukee, Wis.



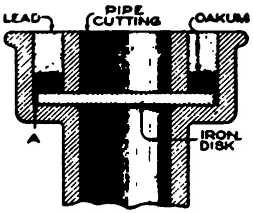
Signboard Shows Where Workman is to be Found



An electrician in a large mill installed on the door of his shop a signboard which saved much time for his fellow employes. When out working in the mill, his shop door was always left closed, and when electric trouble developed in a distant part of the mill, much time was often wasted in finding him. The device consisted simply of a wide board attached outside the shop door, having painted upon it the names of the various departments in the mill where electrical work frequently had to be done. In front of each was drilled a small hole in which could be inserted a plug hanging by a string from a nail in the door casing. When the electrician left his shop, he simply inserted the plug in the proper hole, which notified callers immediately of his whereabouts. Parties calling him by telephone and receiving no answer could call the department opposite his shop and inquire where the electrician was, the question being answered by a glance at the board on the door.

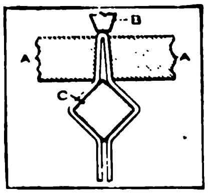
A small piece of slate was inserted in the board below the painted letters, and a plug hole was also made beside this slate. When going to a place not covered by the painted signs, the electrician noted this on the slate with a piece of chalk, and inserted the plug opposite it. The plug was provided with a conspicuous white head made of an old porcelain insulator, and was hung by a cord from a nail in the casing, near the door knob. Thus the door could not be opened without removing the plug from the hole, and there was no danger of the electrician returning without indicating it by removing the plug. This idea could be made use of by many tradesmen. — Frederic Doremus, Passaic, N. J.

Closing Cast-Iron Pipe Ends without a Plug



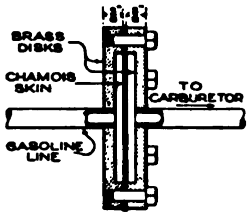
When making some changes to a water system in a country town, it became necessary to cut out several lengths of 12-in. cast-iron pipe. The pipe ends on the remaining pipes therefore had to be plugged at once, and it developed that there were no plugs of proper size on hand. The foreman hunted up a piece of 1/4-in. sheet-iron plate, and cut out several circles on a lathe; he also cut an equal number of short pieces from one end of the removed pipe. Placing the iron disk and short piece of pipe in a pipe hub, he calked in several strands of oakum, soaked in one of the iron-cement mixtures which are for sale, and on top of this he poured in melted lead to the top of the hub. When the lead cooled, it was well calked in. All the joints so made were found to be water-tight, and nearly as easy to remove as the regular plugs. This was done by cutting out the short pipe ends with a hammer and cold chisel. No trouble was experienced with ends splitting from the pressure caused by the lead calking, nor did the joint leak through the oakum.

Compressing Spring Wire While Bending Preserves Strength



In making forming dies for bending spring brass wire, it is usually found impractical to bend the wire to a very short radius, because the wire either breaks at this point during the forming, or is so weakened that it breaks afterward, while in use. Very successful results in the way of bending wire to a short radius have been obtained by compressing the bend at the time it is being made, so that the wire is shortened, rather than lengthened, and the metal is made more compact. In the example illustrated, brass wire is being formed into a garter, and the bend is compressed by the jaws A, and forced with considerable pressure against the fixed pin B. The work is prevented from slipping away B by being bent around the square form C. A wire garter formed in this way was used steadily for two years, without breaking, showing that the wire at the sharp bend had not been appreciably weakened.

Chamois-Skin Gasoline Filter Avoids Carburetor Troubles

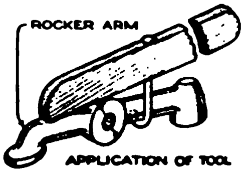


A permanent filter in the gasoline line of an automobile will tend to minimize sediment and water in the gasoline supply. Two brass disks, a circular piece of chamois, and two brass screws are all that is needed. The disks are cut to 3½-in. outside diameter, and recessed out on the inside to about 2½ in. in diameter. The depth of the recess need not be more than 1/8 in. in each disk. This filter, if kept clean and tight, is a positive assurance against water and dirt getting in the carburetor.—Peter J. M. Clute, Schenectady, N. Y.

Lubricated Varnish Eliminates Trouble with Sliding Drawers

To make bureau drawers and other wood surfaces slide easier, add a tablespoonful of powdered graphite to a pint of shellac varnish; stir well to mix it, and apply with a brush; dry 4 to 10 hours before using. One coat is usually enough. —E. L. Howard, Springfield, Ohio.

Tool for Lifting Rocker Arms on Overhead-Valve Engines



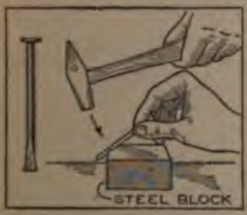
A very convenient tool for releasing the push rods on overhead-valve engines is shown in the sketch. The tool is made from a piece of hard wood, or metal, with a round rod riveted securely and bent as shown. By pulling upon the lever, the valve is moved downward, compressing the spring until the rear end of the rocker is clear of the push rod, which is then removed.—Charles Stuart, Dallas, Texas.

Renewing Enlarged Orifice in Burner

The burner orifice on a blowtorch became so enlarged that it would not burn with a hot blue flame, but with a sooty yellow flame, with raw gasoline spurting out at times. It was impossible to obtain another burner. As a temporary repair, the needle valve was removed, and the flame tube turned off with a pipe wrench. With a ball-peen machinists' hammer, several light blows were struck on the soft bronze burner, which completely closed the orifice. The needle valve was turned back in place just tight enough to pierce through the bronze, making a new orifice much smaller than before. After reassembling the torch it burned perfectly. It has been in daily use for a month since and continues to work well. When the burner becomes enlarged again, the repairing process can be repeated.—John P. Robinson, Hillsdale, Mich.

Preventing Nails from Splitting Wood

When nails have to be driven into a piece of wood which is so thin or narrow that there is danger of splitting, this danger may be much reduced by providing nails with a chisel point such as is used on railroad spikes. To avoid splitting ties, a railroad spike always has a chisel edge and is used with this chisel edge laid parallel to the rails, or across the grain of the tie. Small nails may be sharpened this way by laying them on the sharp edge of an anvil, or other heavy steel block, and striking a heavy blow with a hammer, which will cut off the old point of the nail, and flatten the end to the shape desired. If the flattened end is too wide, it may be dressed off with a file.—Walter L. Morrison, Crozier, N. Mex.



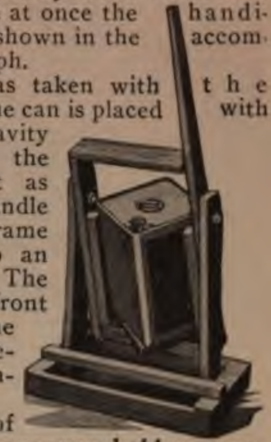
Desk Drawers Made of Bread Pans

In remodeling an office desk, new drawers were made of ordinary bread pans. One end was finished off flush by means of a wooden wedge, to which a face-board and handle were attached. Such drawers slide easily, being supported by the rim of the pan, and are not difficult to keep clean.—E. O. Tetzlaff, Cicero, Ill.

Frame Holds Oilcan and Tilts for Pouring

Anyone who has tried to pour oil from a square can, especially when the can is full, will recognize at once the handiness of the frame shown in the accompanying photograph.

The picture was taken with the frame tilted, but the can is placed with its center of gravity slightly back of the fulcrum, so that as soon as the handle is released, the frame swings back into an upright position. The piece across the front prevents the frame from swinging beyond the perpendicular position.



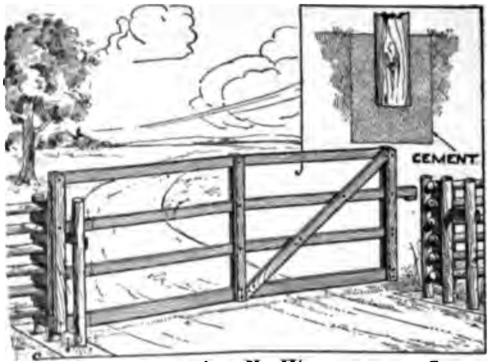
By the use of this arrangement, one may hold a receptacle in the left hand close to the spout, tilt the frame with the right hand, and pour as fast or slowly as desired without danger of spilling oil on the floor. Various methods of clamping the can will occur to the maker, to prevent it from slipping out when nearly empty and turned almost upside down.—Harvey Mead, Scranton, Pa.

Divided Window Shades Permit Fine Adjustment of Light

The device of using two shades, side by side, on a wide window, instead of one, is useful in a number of places; especially in the sick room it will often allow sunlight to enter a room from which it would otherwise be excluded because it might shine too directly on the patient's eyes. In many shops and drafting rooms, also, the device will pay for itself in the convenience which it brings. When both shades are to be raised or lowered at once, no extra time is required, as one hand can be used on each shade.—R. Lee Sharpe, Carrollton, Ga.

A Durable Hingeless Field Gate

All field gates should be made higher than the fence, because restless animals try the gate in preference to the fence.



A Gate Which Requires No Hinges, cannot Sag, and is Easily Swung Open or Closed

Where the gate does not have to be opened very often, the sketch shows a construction which is more durable and often more convenient than hinges. To open this gate, the end at the right is lifted from the bar between the two posts, on which it rests, and is slid along, resting on the cross bar at the other end of the gate, until the cleat across the center of the gate touches this cross bar. The gate is then almost balanced or supported at its center and can be swung around at right angles with very little exertion. This cross bar, on which it is swung, is securely fastened to two posts set at an angle of 45°, as shown.

Any shocks which may come to the gate structure, such as by animals running against it, are taken by these upright posts direct, instead of through hinges. The posts should therefore be set firmly in concrete. A gate with four bars will be sufficient for dairy cows; where hogs or horses are pastured, the gate should have five bars. For hogs, there should be a pole or bar of some kind under the gate, partly buried in the ground, or better, a sill of cement. A good width for such a gate is 14 ft. clear, or 15 ft. total length of gate. A block, at the extreme right end of the gate bar which rests on the bar between the posts, will eliminate any danger of the gate being pushed open by animals.—Herbert A. Shearer, Chicago, Ill.

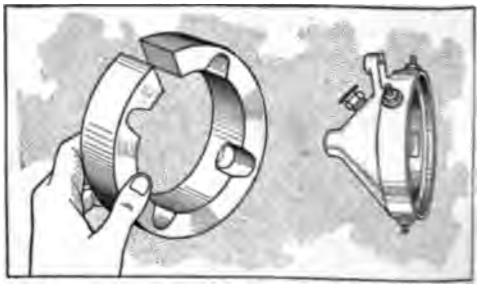
¶To prevent a round-head bolt from turning in wood or metal, drive a prick punch, close to the edge, through the head and hold the punch while turning the nut.

Grooved Pulley Made of Barrel Heads

It was desired to drive a small emery wheel by a round belt from the flywheel of a gasoline engine, whose speed was only about one-eighth of the speed desired for the emery wheel. A large sheave was, therefore, required for attachment to the flywheel. To make this sheave, two 16-in. barrel heads were used, placing them together so that the beveled edges flared outward, and the grain of the two pieces was at right angles to each other. The two barrel heads were fastened together firmly with glue and screws, and were clipped to the arms of the flywheel, a large hole being made in the center of the sheave for the engine shaft and governor. The sheave was centered by measuring, and making equal, distances from several points on the edge of the sheave to the outer circumference of the flywheel.

Chuck Holds Auto Timers for Refinishing

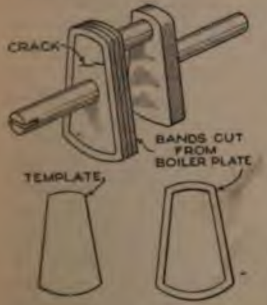
The inner surface on automobile timers wears quite rapidly, and after the car has run 3,000 or 4,000 miles, it is often so uneven that the roller does not make good contact, but jumps from one high spot to the next, causing the engine to miss fire. These timers are not expensive, and are often thrown away without any attempt to resurface the part, largely because the terminal screws on the timer case make it a difficult object to hold in the lathe chuck. Confronted, however, with the present scarcity of materials and parts, one shop has made from cast iron a jig, or special chuck, into which the timer fits, the jig being then held in the lathe chuck. The slot in the piece of iron gives it sufficient elasticity to grip the timer firmly when screwed up in the chuck. A universal chuck must not be



Rather Than Throw Away a Number of Worn Automobile Timers, It will Conserve Material if They are Placed in a Jig, Such as This One, and Resurfaced in the Lathe used, because the outer surface of the timer varies considerably; the part must be centered with reference to the metal contact surface under the terminal screws.

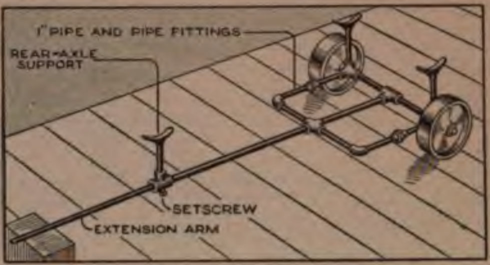
Emergency Repair for a Crankshaft with a Cracked Web

The crankshaft of one of the pumping engines on a ship was found to have developed a crack in its web, which prevented proper working of the engine, and threatened to put it out of service altogether. As it was hardly possible to get a new crankshaft at the time, a repair was made by this method: A template was cut, the exact shape of the web of the crankshaft, except that it was 1/64 in. shorter. By means of this template, three bands were cut, out of 1/2-in. boiler plate, of the shape shown. The inside surfaces of these bands were fitted closely to the template by filing. The crankshaft was then placed in a vertical position, a hole being drilled through the web at the end of the crack to prevent it from extending farther, and the bands, heated red-hot, were slipped over the web. When cool, they bound the defective web together with tremendous pressure, and enabled the crankshaft to be put back into service. The crack was found to have been caused by the bearings being somewhat out of line, and after this condition was corrected, the engine ran satisfactorily, in spite of the extra weight on the crankshaft.



Loading Truck Facilitates Handling of Auto Chassis

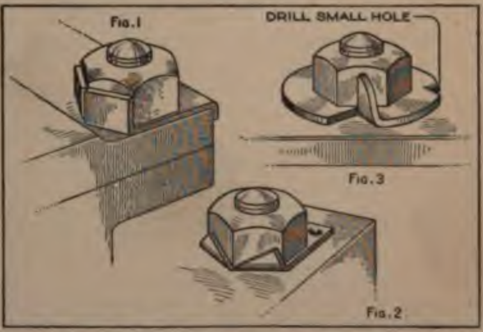
When loading automobile chassis on freight cars considerable twisting and prying is usually necessary to get them in through the narrow doors. To simplify this operation, a truck, as shown in the sketch, was devised. It consists of two heavy metal wheels attached to a substantial axle, and a tubular extension carrying three supports. The supports are so arranged that they fit onto a convenient part of the front axle and hold the chassis from slipping sideways. The third support engages the differential of the car. In operation, the truck is wheeled about by means of the extension handle.



Auto Chassis, Which Are Heaviest at the Front End, are Readily Handled with This Truck

Easily Made Lock Washers

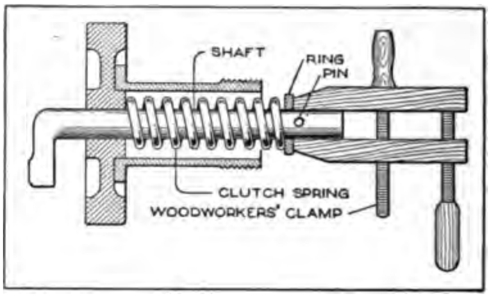
These three types of lock washers are the invention of a practical mechanic; each of them has been tested and found efficient. They have the advantage of being both cheap and easy to make. In Fig. 1, the washer is cut oblong, the hole is drilled in the center, and one end is split and spread. This washer is slipped on, and the two tabs are bent up against the flat sides of the nut, while the other end is bent downward over the edge of the part held. Fig. 2 shows a common square washer, made of 1/16-in. sheet iron. When washer and nut have been tightened down, a prick punch is driven into two corners, and the other two corners are bent up against the flats. Fig. 3 is a common round washer, slotted as shown with a hacksaw. A small hole is drilled in the work in any place at the edge of the washer, and a section of the washer is drifted into this hole. The larger lug is turned up at right angles, so that it bears against the nut.



Three Types of Lock Washer Which are Easily Made and Useful in Machinery Which is Subject to Vibration

Compressing Stiff Clutch Springs with Woodworkers' Clamp

A woodworking clamp is a good tool for removing and replacing the clutch springs on automobiles. The clamp jaws are simply tightened on the shaft, with the ends bearing against the ring, or collar, which retains the spring in position. The clamp is driven on with a hammer, compressing the spring until the retaining pin can be removed or replaced, as desired. The advantage of the clamp method is its adaptability to different sizes of shafts. Often, too, awkward places, in which springs are difficult to compress, can be easily reached by the protruding ends of the clamp jaws.—G. A. Luers, Washington, D. C.



A Woodworkers' Clamp, Driven On with a Hammer, Compresses the Clutch Spring, So as to Extract or Replace the Pin

Fuel-Saving Kinks Valuable in the Home

If the fire box of the stove is partly filled with bricks or stone, leaving the center for the coal, a fire can be made with less coal, which will have more heating ability than it would have without the bricks or stone to absorb the heat.

Too much heat in a home, that is to say, any temperature above 68°, the point which has been set by the Fuel Administration as a proper room temperature, tends to produce something which dangerously approaches laziness. This is felt plainly when the temperature runs up to 75 or 80°, but is present even at 72 degrees.

Fires in bedrooms are unnecessary. A bed can be warmed before retiring, if absolutely necessary, by hot water in a bottle or jug, or by an electric-light bed warmer, and this will be found after use to be even more luxurious than a heated bedroom, and decidedly more sanitary and economical.

'hen the fire has died out and the room is beginning to get chilly, if one must still sit in it, place a kerosene lamp under the chair and it will save the necessity of firing up again.—B. W. Rice, Caldwell, Idaho.

Pedal Switch for Emery-Wheel Motors

Emery wheels do not take a great deal of power, but when it is considered that they often run all day, while the total time during which they are actually used does not amount to more than perhaps half an hour, it will be seen that a considerable waste of energy is involved. One way to reduce this is to install a pedal control for the switch or belt shifter, together with a spring, so that the switch will be opened or the band shifted back to the loose pulley by the action of the spring, as soon as the tension on the pedal is released. It may, of course, be objected that a workman would have to wait a few seconds while the wheel was reaching its full speed, thus losing time, but in many cases, this time can be fully occupied in examining the tool to be ground, and determining the exact angle at which it is to be held.

Foot Control Handy for Faucets in Washbowls

Foot control for the wash basin is recognized as the most convenient and sanitary method, and its adoption would be much wider than it is, if its advantages were better known. It will contribute wonderfully to the cleanliness and convenience of the shop washbowl, if a pedal is installed so that pressure, applied to it with the foot, turns on the water, it being turned off by a spring, when the foot is removed. In this way, the convenience of a steady stream of water is secured, while at the same time all danger of the water being left turned on by a careless person is eliminated.

¶Time can be saved in photographic work by making a mark on the bottle, to indicate the amount of hypo, or other material, usually weighed out in making solutions.

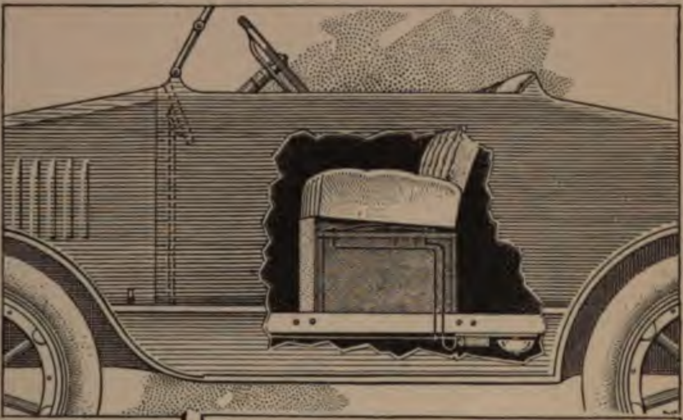
Automobile-Thief Alarm

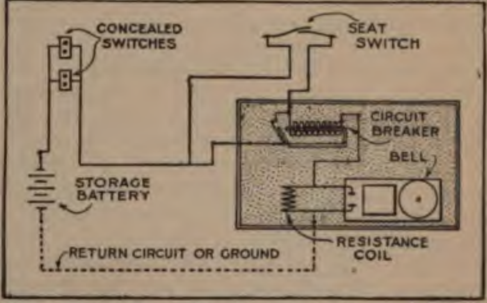
By E. W. RANSTON

MANY good and efficient automobile locks have been called into existence by the epidemic of automobile thefts, and there is now no excuse for leaving a car unprotected. The locks in general use are of several classes, each presenting its own advantages and open to its own objections. Electrical locks for merely breaking the ignition circuit were the first on the scene, and are still used to some extent, although no expert automobile thief would be delayed by them for more than a few seconds, as he would simply connect around the "lock" with a wire leading directly from the battery to the igniter. Gasoline-line locks are useful, but somewhat complicated in their installation, and introduce the questionable element of additional opportunity for gasoline leakage. Probably the favorite method is a purely mechanical lock, on the steering gear, the starting crank, or some other essential part of the mechanism.

While all of these locks may be relied upon to prevent or at least delay considerably the work of the thief, few, if any, of them are of any assistance to the police in capturing the would-be thief. The device here described is intended to accomplish this purpose, and at the same time furnish a protective device with all the convenience of the ignition lock.

The effect of the contrivance is that, when a thief enters the car and takes his place in the driver's seat, an invisible alarm bell under the car starts ringing, and continues to ring even after the thief leaves his seat and seeks safety from the police or citizens who are sure to be attracted by the noise of the bell. The bell will continue to ring until the owner returns to the car, or until somebody finds the hidden control switch and turns it off. Of course, if the thief is ingenious enough to find this switch at once, he can turn off the alarm himself, but there is small chance of a thief working very long around a car to the accompaniment of a loudly clanging bell.





As the Thief Takes His Seat at the Steering Wheel, He Sets Going an Invisible Alarm Bell, Which Continues to Ring Until Switched Off by a Concealed Switch in Another Part of the Car

The various parts of the circuit and their connection are shown in the diagram. The materials needed are: one or more small switches to be concealed as well as possible within reach of the driver; a good, loud electric bell; a relay, or circuit breaker, such as is used on nearly all modern automobiles to connect the generator to the battery when the proper speed is reached; some resistance wire, large enough to carry several amperes of current, and some pieces of wood and spring brass to make the seat switch. As will be noted in the circuit diagram, when the concealed switch is closed and the seat switch is afterward closed, the circuit through the bell is established, and, at the same time, the current flowing through the circuit breaker closes a circuit which connects around the seat switch so that, even though the latter is open, the bell continues to ring. The resistance coil would not be necessary if the circuit through the bell was continuous. Since, however, it is interrupted at each tap of the bell, the coil is necessary, in order to maintain a sufficient current through the circuit breaker to keep it from permitting the shunt circuit across the seat switch to open, thus stopping the alarm. The only way in which the alarm can be stopped is by breaking the main circuit, either at the concealed switch or at some other point. If properly wired, this cannot be done by a stranger without spending considerable time, which, under the circumstances, is out of the question for a thief, at least in a city or town.

The making of the seat switch will not be difficult for any electrical experimenter, and its successful working must, of course, be tested by experiment. The sketch may give a suggestion. It will be advisable to carry the two wires from the seat switch directly down below the car, where the circuit breaker, bell, and resistance coil can readily be mounted in one removable unit. As the current first comes through the seat switch, it will close the contact points; as the seat switch is opened, the current flows through the shunt circuit, including the contact points, and keeps the points closed until the main circuit is broken.

The unit under the car, consisting of the bell, circuit breaker, and resistance coil, will have two wires leading from it: one to the seat switch and one to the concealed switch. If the car is wired on the double-wire system, there will also have to be a return wire to the battery. With the grounded-battery system, there is simply a connection from the unit under the car to some screw or nut on the frame of the car.

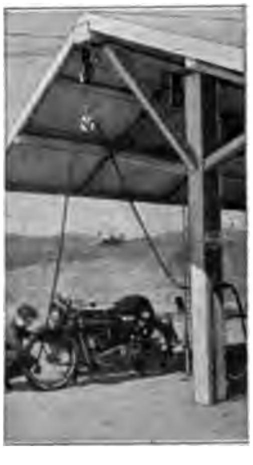
The concealed switch may be located in a pocket on the door, just behind the dash board, under a corner of the floor mat, or any other place where it will be out of *sight*; or it may be built into a combina*tion, or key, lock.* Ignition locks designed for use with magnetos, which have a closed circuit when locked, are readily used for this purpose. One advantage to be gained by the concealed-switch idea, however, is that there is no visible indication that the car is locked, thus encouraging the thief to get himself trapped. Car owners who regard this as a disadvantage, preferring to notify the thief in advance that the car is protected, may use a lock switch. If the thief then connects across the two wires leading to it before taking his seat at the wheel, he will not have prevented the gong from giving the alarm. Using two or more concealed switches presents an additional advantage, as closing any one of them throws on the alarm, and all must be open to throw it off.

Etching on Glass and Metal with a Sandblast

A sandblast may be made use of in many novel ways. Any part of an electric-light bulb may be frosted by covering the other part of the glass with a piece of heavy paper, and exposing to the sandblast. A similar process will serve to etch any lettering or design on any glass or polished-metal article, and a finish may be given to soft wood which gives it the appearance of being hand-engraved.

Weight and Pulleys Keep Air Hose Convenient and Reduce Wear

The usual air-hose arrangement about garages and service stations is frequently a source of annoyance to both motorists and attendants alike, and when the hose is dragged about on the ground, it is very short-lived. The weight-and-pulley mounting, illustrated in the accompanying photograph, keeps the hose up out of the dirt at all times. Its position is convenient for getting at all four wheels of a car; it is in the shade, and is not needlessly worn by being dragged out over the

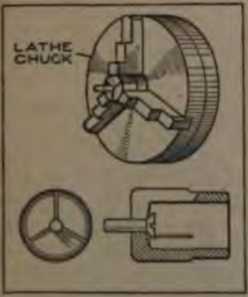


ground or left in a position to be run over by machines. This type of hose support costs little to install, and will pay for itself many times by the convenient service it renders and the reduced wear on the hose.—John Edwin Hogg, Alhambra, California.

Moving "Rusted-In" Screws

Steel screws which have rusted into place are difficult to remove. They can often be loosened by tapping the screwdriver with a hammer, or by heating, but a better way is to treat them before setting them in place with a rust preventive. Common oil will do this to a slight extent, but a mixture of graphite and tallow rubbed onto the screw, will be effective for a much longer time.—S. Leonard Bastin, Bournemouth, Eng.

Holding Screws While Threading or Turning Them



When small screws must be turned or threaded in the lathe, time is often lost because no chuck is at hand which fits the screw. A collet, to be held in the chuck, and to hold securely the size of screw for which it is designed, is made from a piece of round steel. It should be about 1⅛ in. in diameter, and its length should be somewhat greater. Drill a hole clear through it, the size of the screw to be held; then, from one end, ream this with a ¾-in. drill, to within ¼ in. of the other end. Turn down slightly the half of the piece from which the ¾-in. hole was started, so as to provide clearance. With a hacksaw, saw three or four slots, as shown, so as to form a spring collet. The number of slots should be the same as the number of jaws in the lathe chuck. The collet may be hardened, or casehardened if convenient, and its life will then be much longer. If the collet is accurately made, a universal chuck will be satisfactory to use with it; for extreme accuracy, however, which is often necessary in small work, the chuck with independent jaws is to be preferred.—E. L. Howard, Springfield, Ohio.

Large Kettle Inverted over Soft-Coal Fire Saves Heat

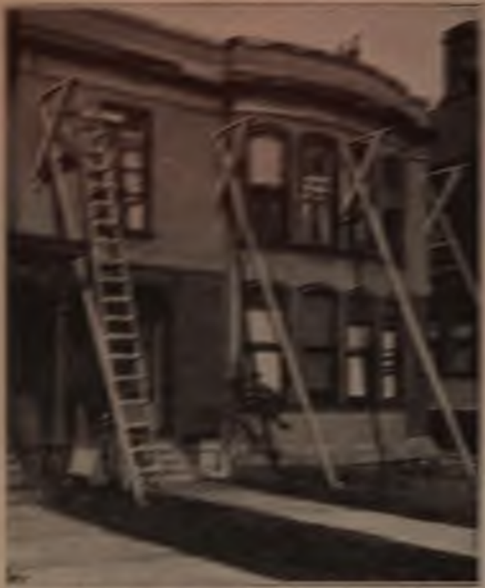
On putting fresh soft coal into a stove, an intense smoke is given off, which fouls the pipes and spreads soot over the room, besides wasting coal. A means for diminishing this was found in a large iron pot. The pot was provided with a ring on the bottom, by means of which it could be carried on the end of the poker. Immediately after putting on fresh coal, the inverted pot was set on top of the fire and was found to have the effect of causing the smoke and coal dust either to collect inside the pot or to escape around the edge, where the gas would burst into a ring of flame, consuming much of the coal dust, which would otherwise be wasted. The kettle is left on until the fresh coal becomes hot and is reduced to coke by having the gas roasted out of it; the pot is then removed, leaving a coke fire, which burns and lasts very well.—A. S. Thomas, Amherstburg, Ontario, Can.

Carry Tool Checks on a Safety Pin

In shops where each workman has a number of tool checks bearing a number, one of which he deposits in the tool room as a receipt for a tool taken out, the loss of these checks may sometimes involve unpleasantness. A safer way of carrying them than in the pocket is to sew a large, strong safety pin to the overalls or shop clothes and hang the checks upon it. The checks can be removed or replaced with either hand, so that the other one is left free for carrying the tools.—C. C. Spreen, Detroit, Mich.

Scaffolding without Nails

On a repair job where the scaffolding could not be attached to the side of the house, and it was not desired to build up a whole structure from the ground, a contractor designed a number of brackets, which enabled him to get at the work conveniently and safely after very little preparation. The brackets were made of 2 by 4-in. scantlings, each brace consisting of two pieces nailed together so that the central portion, where the greatest stiffness is required, is full 4 by 4 in. The braces fit snugly into the brackets, and the whole scaffolding can be removed in a few minutes and carried to another job.—W. K. Crosson, Detroit, Mich.


Brackets for Scaffolding Supported by Long Braces Reaching to the Ground are Found Useful on Repair Jobs

Keeping Brushes Soft with Paraffin

Keeping paintbrushes soft by placing them under alcohol, turpentine, or other such liquids, is a somewhat expensive method, especially when the brushes are to be out of use for long periods. If a brush which is still moist with paint or shellac is dipped in melted paraffin several times, so that a heavy coat of the paraffin adheres to it, the brush will retain its softness indefinitely, the paraffin preventing any evaporation. To remove the paraffin, merely pull it off; it will come easily, leaving the brush as fresh as when the paraffin was applied to it.

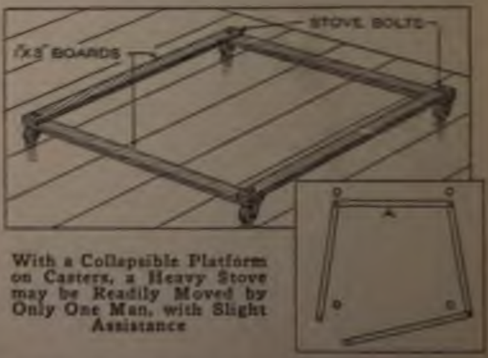
Keep the Lamps Clean

A simple explanation of a gradually failing light in many shops is to be found in that lamp globes and shades are not kept clean and, therefore, do not transmit or reflect the light properly. A little attention to keeping the lamps clean will often enable a shop to avoid the necessity of installing more lights or to have much better illumination with those already installed.—William Philip, Bloomfield, N. J.

Small Truck Aids in Moving Stove

Here is a device that is cheap and easily made, and will enable one grown person, with the help of a child, to move quite a large stove. The frame, of strips, 1 by 3 in., is bolted at three corners with ½-in. stove bolts, and casters are fastened beneath with screws. In the fourth corner the bolt is first put through the upper board only, and the nut put on to hold it firmly in place. The platform should be made the proper size so that the stove legs may rest on the corners right over, or slightly to the inside of, the bolts. If this is not done there will be some trouble in putting the stove in place.

To use, have the loose corner open, and place the frame near the stove legs. Tip the stove forward so that the strip A may be put into place beneath the back legs. Then, lifting the front, draw the frame together and into position. The bolt in the top strip should drop into the hole in the lower one, and be fastened with a nut. Now the stove may be wheeled into the exact position desired, and by reversing the directions given above may be quickly unloaded. It is better to load the heavy end first and unload it last. Through the summer it will do no harm to let the stove stand on this truck. The casters should turn readily in any direction. Good ones can be purchased at five cents each.



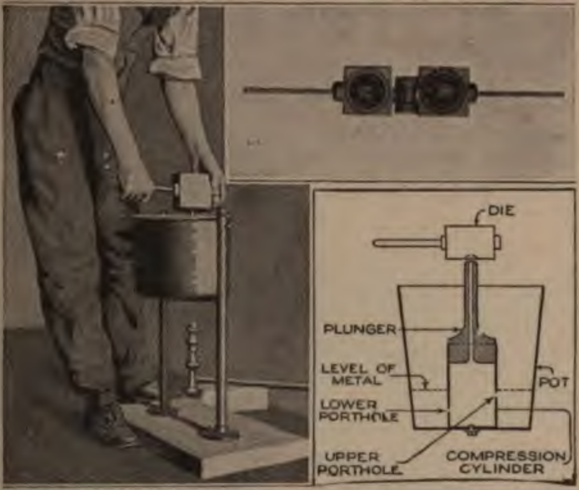
With a Collapsible Platform on Casters, a Heavy Stove may be Readily Moved by Only One Man, with Slight Assistance

A Homemade Die-Casting Machine

By C. M. MAHOOD

ONE of the interesting processes which has been introduced recently in quantity-production factories is that of making quite accurate finished castings without machining, by the process known as die-casting. In this process, the melted metal is forced into dies under pressure, and after it has cooled, the dies are opened and the finished castings removed. It is thus possible to cast parts which have the "particular" dimensions accurate to the thousandth of an inch, or even less. The metals used are alloys of fairly low melting points, as it has not been found practicable to make dies which would stand up under the temperatures necessary for casting iron or steel.

While die-casting is more particularly a factory process, yet, for certain jobs, it is entirely possible to use to advantage some methods of die-casting in the small shop. Whenever a considerable number of small parts have to be made which do not have to be of great strength, but should be accurate, the method of casting the parts directly to the finished shape should at least be carefully considered.



A Die-Casting Apparatus for the Home Shop: To the Left is Shown the Method of Making the Castings. The Smaller Photograph Shows a Type of Die for Casting Disks, and the Sketch Shows the Construction of the Apparatus

The apparatus herewith illustrated, which is almost entirely homemade, enables anyone to apply, in a somewhat crude way, the die-casting process. An ordinary iron kettle forms the pot in which the metal is melted, while two pieces of ¾-in. iron pipe, with two caps and two floor flanges, form the uprights which support it. These are set up and given a coat of stovepipe enamel. If the metal used is one having a fairly high melting point, so that the pot becomes excessively hot, a sheet-iron jacket may be placed around it, extending to the floor and inclosing the gas burner, gasoline torch, or other means of heating.

To the bottom of the pot is riveted a steel cylinder, which has an inner surface quite accurately machined. An old automobile cylinder, if not too badly worn, will serve, and the plunger may be made from the automobile piston, or machined from a very simple iron casting. The plunger is suspended by a wire loop tapped into it just beside the stem, and a cord runs from this loop to a lever, at the other end of which is a spring for the purpose of counterbalancing the plunger and automatically raising it, so as to clear the upper porthole. This hole, or slot, is about 1½ in. wide and ¼ in. high, and forms the main entrance for the metal from the surrounding pot. The level of the metal should be kept just above this porthole. A small porthole, about ⅛ in. in diameter, is also made near the bottom of the cylinder. Up through the stem of the plunger runs a ¼-in. hole, and the top of the stem is turned off to fit any standard countersink, which will be used in countersinking the sprue hole in the dies.

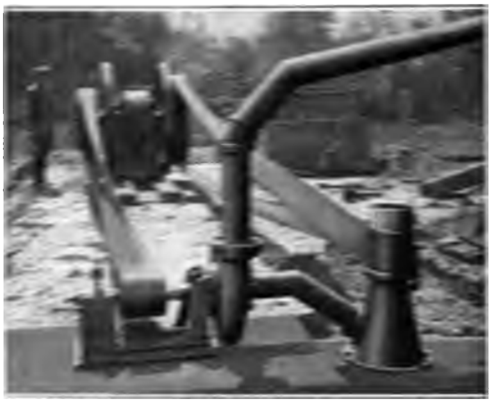
The dies are made in any of several ways. If one wishes to go to the expense of getting a high-quality die for long service, it can be ordered from a commercial die sinker. For certain types of parts, the die can be made by pouring out two pieces of cast iron and fitting them with dowels and wooden handles, and finishing the die inside with plaster of Paris. Such a die is readily made and is useful for short rough runs.

The operation of such an apparatus is as follows: Fill the pot with metal to a height slightly above the upper porthole, and heat the metal to 100° or 200° F. above its melting point, in order to offset cooling in the stem of the plunger. Heat the die with a blowpipe flame before making the first casting; after the run is started, the die will be sufficiently heated by the hot metal, and in the case of large parts may even have to be cooled somewhat between operations. Lubricate the

[illegible]

Pumps of Centrifugal and Screw Type Work Together

[illegible]



[illegible] Screw Pump Raises the Water to the Surface, and a Centrifugal Pump Then Takes Hold and [illegible] to the Storage Tank

[illegible] a heavy head [illegible] would be best. On account of the limited suction capacity of such pumps, however, it was also evident that a deep and expensive pit would have had to be built.

On the other hand, one of the new type of screw pumps, made to fit the casing of the well and sunk below the suction limit, [illegible]

[illegible] the efficiency of such pumps is greatly increased by a heavy head of water. [illegible] greatly increased.

[illegible]

Staining Wood a Dark Color with Roofing Cement

When a dark-walnut flat finish is desired in woodwork, one may use the cement which is furnished with rolls of composition-roofing material. To use this cement for a stain, work it sparingly into the wood with a lintless cloth, or small varnish brush; if any surplus cement remains, take it off with the cloth. The results obtained with this novel staining material are declared to be very satisfactory.—H. K. Capps, Stahl, Mo.

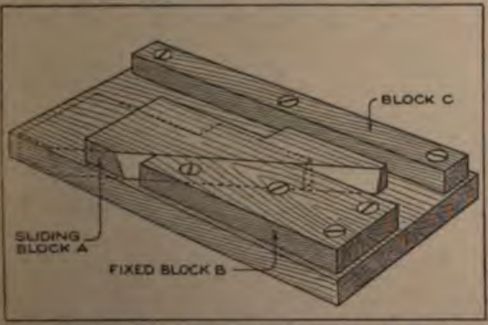
Groove Plane Made from Rip Saw

It will often be found on an old rip saw that the teeth near the handle remain quite sharp, although the teeth near the center of the saw are entirely worn out. If the saw is cut or broken off 8 or 10 in. from the handle, the short saw thus formed can readily be mounted with a few wooden blocks to form a groove plane. By giving the teeth a pronounced set, the groove cut may be made somewhat wider, if desirable.

A Bench Stop Which Clamps the Work

Ideas without number have been brought forth for bench stops and similar devices to hold work on the bench while planing or chiseling. All of them have their own virtues, but few have the property of clamping the work tightly when it is pushed into or against them.

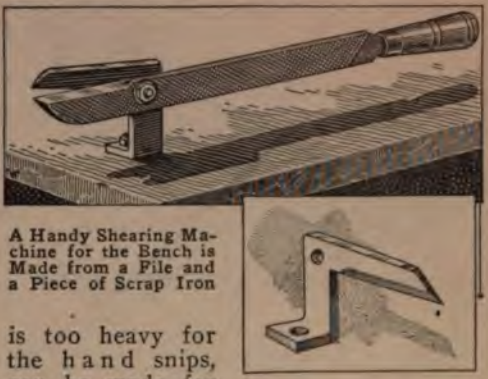
A stop which has this property to an excellent degree and yet is simple of construction, is here illustrated. It consists of a sliding block, A, with one edge cut to a bevel, as shown; a fixed block, B, which also has one edge cut to a similar bevel, so that the edge of A fits against it and the straight block C. Blocks B and C can be fastened to the bench directly, or to a block on top of the bench. The notch opposite the bevel edge of block A is made of such size that it will take a certain range of jobs. Any number of blocks A can be made, each having a different shape and notch, and each taking a certain range of work. The work is inserted in the bench stop by simply laying the end of it in the notch in the block A and pushing it forward, so that the work is wedged in between A and C. It is loosened by merely striking a blow on the small end of block A.—E. K. Wehry, Cedar Rapids, Ia.



A Simple but Efficient Bench Stop: As the Work is Pushed Forward into the Stop, the End of It is Firmly Clamped without Marring

Bench Snips or Shears

Very handy and cheap bench shears for cutting tin, or other sheet metal, which is too heavy for the hand snips, can be made for the home-shop workbench, as indicated in the drawing.



A Handy Shearing Machine for the Bench is Made from a File and a Piece of Scrap Iron

A 14-in. flat file, with one side ground smooth, and a portion of the tip and one edge sharpened, makes the movable shear knife. The fixed cutter can be forged from a part of an old plowshare, or other suitable scrap steel. The bolt hole in the file is punched while the file is at a cherry-red heat. A locknut must be used on the bolt, or else the end must be riveted.—Chas. H. Willey, Concord, N. H.

Drilling Holes through Heavy Metal with a Bit Brace

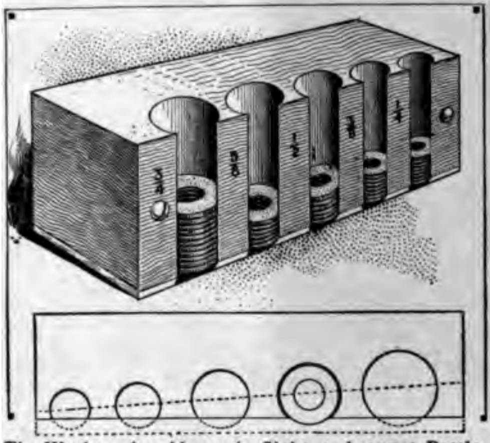
When holes of a diameter greater than about 1/4 in. must be drilled through iron of considerable thickness with a bit brace, the big part of the job is to maintain the proper pressure on the drill. It will be much easier if a small hole is first drilled by means of a hand drill, of, say, 1/8 in. diameter, the hole being reamed to size with the large drill in the brace, which will then require much less pressure than without the small hole.—Chas. A. Black, Jr., Hightstown, N. J.

Universal Lathe Chuck Used as a Vise

A universal chuck mounted face upward on a heavy wooden block is a useful type of vise for many purposes in the shop. Any job that would be held in the chuck for lathe work can be held similarly in this vise, and is then ready for any handwork, such as laying out, filing, or scraping.—H. S. Hart, Shreveport, La.

A Rack for Washers

Workmen who have frequent use for plain washers of various sizes, and who like to keep them handy so that they can be picked up and put into place as quickly as possible, may find it convenient to make a rack like the one shown in the sketch. It is made from a single block of wood, by boring holes slightly larger than the respective diameters of the washer to be used. The line on which the center for these holes is laid out should be slightly out of parallel with the edge of the block, and should be located so that the largest hole to be made will not meet either edge of the block. Then, after all the holes are drilled and a piece of cigar-box, or other thin, wood is attached to form a bottom, plane off the block, so as to expose the holes from the side. The washers can be stacked in the rack by simply dumping them in and shaking the rack about.



The Washers Are Always in Sight, and cannot Rattle Loose. The Rack is Easily Filled, and One or More Washers are Easily Removed with the Fingers

Enlarging Pistons by Peening to Eliminate Slap

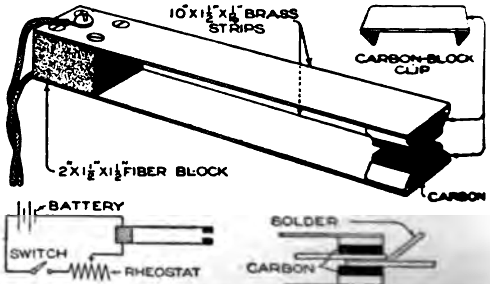
When an automobile piston is found to be "slapping," due to the skirt being too small, one way to remedy the trouble is to remove the piston from the connecting rod, lay it upon its side on an anvil, and strike a succession of blows with a ball-peen hammer on the inside of the skirt. The blows should be light and very even, and uniformly distributed. The piston should be accurately calipered to see that the enlargement is proceeding properly and that the peening is not bending the skirt slightly out of round. A piston thus treated, fitted with good-quality piston rings, will often give satisfactory service where oversize pistons would otherwise have to be fitted.

Electric-Soldering Tongs

Simple soldering jobs, such as splicing wires, fastening cable leads to terminal clips, or sweating metal plates together, may be quickly and neatly done with electric-soldering tongs. The parts to be soldered are brought almost instantly to the correct heat, which is not possible with the ordinary soldering copper.

Two spring-brass strips, 10 in. long, 1½ in. wide, and at least 1/16 in. thick, are used to carry the electric current to the carbon electrodes as well as to form the tong handles. Form two brass clips of such dimensions that they will each hold a piece of carbon, 1 by 1 in., by ½ in. thick. Rivet them to the end of the brass strips; a good job of riveting must be done, and the clips must seat snugly against the strips so that a good electrical connection is assured. Saw a block of fiber 1½ by 2 in., by 1½ in. thick. Drill small holes in the free ends of the strips so that the latter may be screwed to the fiber block, parallel and insulated from each other. Provide electric wire connections to the brass strips.

The tongs must be operated from a low-voltage circuit, and for most shops the storage battery will best meet this requirement. For temperature regulation during soldering, a variable resistance or rheostat should be used to decrease or increase the flow of current. To solder, it is only necessary to grasp the piece or pieces to be worked on between the carbon electrodes by using the device like a pair of tongs. The instant an electric circuit is established between the carbons the latter should come to a red heat, and soldering is the work of but a few moments.



The Electric-Soldering Tongs Operate on a Principle Similar to That of Electric Welding, the Heat being Due to Passage of Heavy Current through the Work

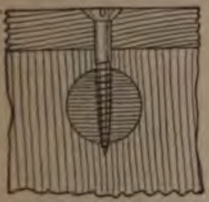
If desired, the brass strips may be

wrapped with friction tape for convenience and safety in laying the tongs down; it is not necessary for protecting the hands, if the rheostat is wound noninductively.—Kenneth Coggeshall, Webster Groves, Mo.

Soldering Paste Carried on Torch

A handy way to carry soldering paste, when working on poles or ladders, is to solder a piece of 1½-in. square brass tubing, about 3 in. long, with a bottom soldered in it, to the side of the blowtorch. Fill it with paste, and it will always be handy when wanted.—E. C. Galbreath, Denver Colo.

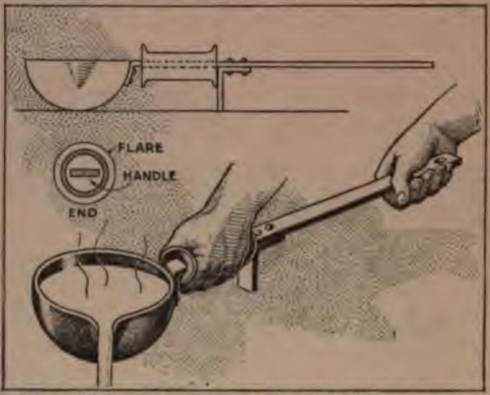
Making Wood Screws Hold When Parallel to Grain



Wood screws inserted into the end of the grain, especially of soft wood, do not take a very strong hold. The hold may be improved by backing out the screw after it is inserted, placing a small amount of glue in the hole and then reinserting the screw. When screws are to be taken out repeatedly and reinserted into the end of the grain, as is often necessary where work is required to be taken apart in the foundry, simply screwing them into the end of the grain should not be depended upon. In such cases, insert at right angles a hardwood plug, as shown, and allow the screw to pass through it. When the screw will no longer hold in consequence of its repeated withdrawals, the worn-out plug may be taken out and a new plug inserted.—Ernest Schwartz, Brooklyn, New York.

Improving an Old Ladle

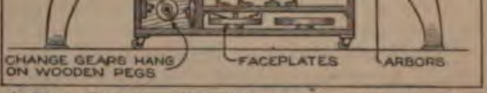
Small ladles for pouring babbitt or lead can often be improved as shown in the sketch. A piece of tubing, about 5 in. long and flared out at both ends, is slipped over the handle. A piece of steel, bent to a right angle, is then riveted onto the handle, back of the tube, serving the double purpose of holding the tube on and of forming a leg so that the ladle can be set down, if required, without tipping over. In order to serve its purpose well as a leg, this piece of steel should be at least 1 or 2 in. wide. By gripping the tube handle with the left hand and tilting the ladle by gripping the end of the long handle, with the right hand, the metal can be poured quite readily. Hold a piece of folded cloth, or soft asbestos, under the left hand around the grip, so as to protect the hand from the hot metal surface.



A Steel Leg, and a Grip of Metal Tubing over the Handle, Make the Old Ladle More Convenient in Use

Neat Chest under Lathe Holds Tools and Gears

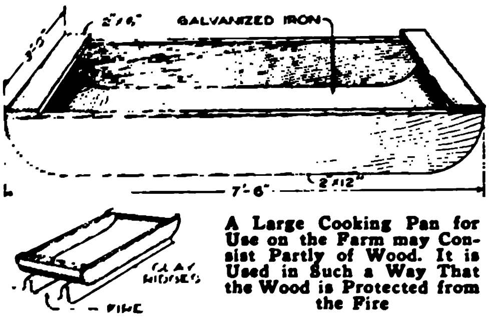
The chuck and faceplates of a lathe in many shops will be found either on the floor or hanging somewhere about the legs of the lathe. The drawing suggests a means of keeping the chuck, faceplates, dogs, and gears neatly where they can always be found, and of having the drip pan in a proper position at the same time. The tray may be removed from the box to dump out the oil and chips from the lathe, and the entire box can be rolled out on its casters when sweeping the floor.



A Chest Placed under the Lathe Carries the Drip Pan on Top, and Has Shelves and Hooks for the Lathe Tools and Accessories

Vessel for Cooking Potatoes for Hogs on the Farm

It is not necessary to feed raw cull potatoes to hogs just because there is no cooker on the farm. One 16-ft. plank and a sheet of galvanized iron, together with a few nails, will make a good, serviceable cooking pan that will last all winter if it is used carefully.



A Large Cooking Pan for Use on the Farm may Consist Partly of Wood. It is Used in Such a Way That the Wood is Protected from the Fire

The plank should be 2 by 12 in., and long enough to be cut in two pieces, 7 ft. 6 in. long. The two pieces are rounded at both ends, sled-runner fashion, and made square and smooth on the edges with the plane and drawshave.

The galvanized iron should be No. 24 gauge, or thicker. It should be 3 ft. wide and 8 ft. long. It is thoroughly nailed to the edges of the planks with eight-penny wire nails. The cooker is finished at the ends by crosspieces of wood to protect the edges of the galvanized iron and stiffen the frame.

To use the cooker, it should be placed on two ridges of clay, made level and plastic with water so the cooker fits down tight all along both sides. The fire is made near the windward end, so the draft will carry the heat under the whole length of the cooker to get the full benefit of the fuel.

There should be enough water in the cooker to boil the potatoes soft without burning. Just before the cooking is finished, let the fire die down, and dip all surplus water out so the mass of potatoes will steam dry, just as in cooking potatoes for household use.

This heating pan may also be used to heat water for scalding pigs at killing time.

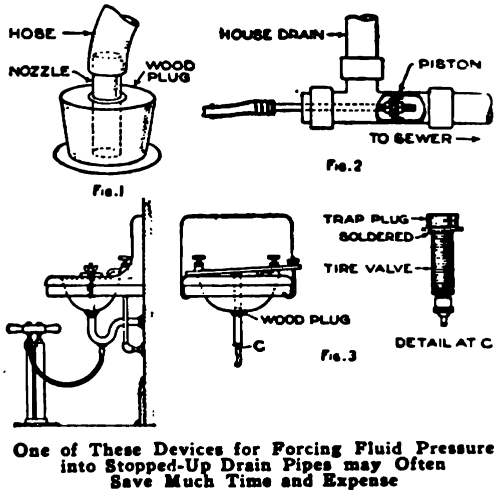
¶Rubber cement is good for patching clothing. Use according to directions given for rubber; pressure with a hot iron will vulcanize the job if desired.

Cleaning Out Clogged Drains with Fluid Pressure

In many cases the handiest way to clean out drain pipes which have become clogged with dirt, is by means of water or air pressure. It is, of course, quite common to use the nozzle of a hose, thrusting it down through the drain and turning on the water under high pressure, this method being used often in cleaning out sewer outlets in city streets. The objection to such procedure is that the water backs up into the sink or washbowl. This can be prevented by making a taper plug of wood, as shown in Fig. 1, which can be fastened on the hose nozzle and thrust into the drain inlet so as to prevent the possibility of the water backing up.

Another way to prevent the backing up of water, which is useful in places where the above method would not be practicable, is to make, on the end of a piece of ¾-in. pipe, a piston of proper size, as in Fig. 2, to be pushed into a large drain pipe which has become clogged. To the other end of the piece of pipe the hose is attached, and water is then forced in without danger of backing up.

Where water pressure is not available, it is possible to use air pressure as furnished by an automobile-tire pump, as shown and detailed in Fig. 3. One way to do this is to unscrew the plug at the bottom of the water trap below the washbowl, and solder into this plug an automobile or bicycle-tire valve. Then, if the bowl outlet is tightly plugged, air can be forced in at a pressure high enough to dislodge the dirt which causes the congestion.



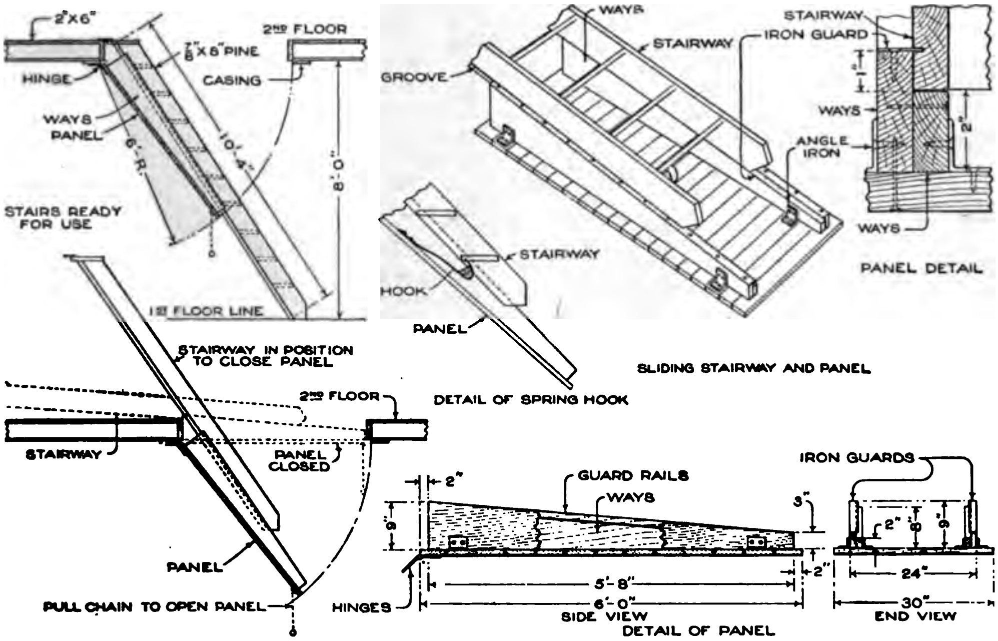
One of These Devices for Forcing Fluid Pressure into Stopped-Up Drain Pipes may Often Save Much Time and Expense

A Disappearing Stairway

By L. B. ROBBINS

A STAIRWAY which can be quickly and easily disposed of so as to give needed floor space in the bungalow, or small cottage, is a thing generally much desired. Such stairs are not at all difficult to construct.

As will be seen in the sketches at the left, the stairs are hung in an opening, or well. This should be cut 6 ft. long, between two adjacent rafters. It is then boarded in on the sides and ends, the boards coming flush with the ceiling of the room. A casing of 6-in. boards should be laid around the edge of the well, so that the edges of these boards will just meet the edges of those inside the well.



A Stairway Which Is Lifted Out of the Way in a Few Seconds: It Is Only Necessary to Slide the Stairs Upward on the Ways Until They Catch on the Spring Hook, and Let the Panel Rise Flush with the Ceiling. A Corresponding Operation Brings the Stairway Down, Ready for Use

The swinging panel is constructed in such a way as to make a presentable appearance to the occupants of the room when it is swung up in place. It is 6 ft. long and 2 ft. 6 in. wide, supposing the rafters to be 30 in. apart. If the ceiling timbers are spaced any other distance between centers, make the panel of a width to correspond, so it will lap over the edge of the sides of the opening about 1 in. When the well is ready for the panel ~~it~~ should measure 5 ft. 10 in. by 2 ft. 4 in.; the panel then sets into, and flush with, the casing.

The upper face of the panel is provided with inclined ways, as illustrated to the right. Cut two boards to the shape shown for the guard rails, of 7/8-in. stock, 9 in. high at one end, and 3 in. high at the other. Then make another pair for the ways, 8 in. high at one end and 2 in. at the other. Match each pair and screw them solidly to each other, the ways inside of the guard rails. Along the top edge of the latter, screw strips of band iron, 1½ in. wide. See that this iron has straight and parallel edges, and that the outside edges are flush with the guard rails. The ends of these boards should come at least 2 in. from each end of the panel. Fasten the guard rails to the panel with angle irons. Hinge the panel at the heavy end to the casing of the well with solid hinges, and provide the free end with a chain by which it can be pulled down to put the stairs in service.

The stairs illustrated are for a room 8 ft. high; the length can be easily varied to suit the height of any room more or less than 8 ft. Cut the sides from two 8-in. pine boards of 7/8-in. stock. The longest edge, as indicated, should be 10 ft. 4 in. long to obtain a good angle for such a stairway. The bevel at the lower end is 6 in. wide, and the top bevel can be cut parallel with the upper floor by setting the sides in place temporarily and marking with a straightedge. The width of the steps should be such that the sides will fit fairly snugly down on to the ways, yet not so tight as to bind in the least. Then a groove should be cut along the outside of the sides, into which will slide the edge of the iron straps, or guards. These prevent the stairs from being pulled away from the ways. Set in the treads, parallel with the floor, and the same distance apart all the way up. It is well to mortise them into the sides about ¼ in. to stiffen the structure. Angle irons at the top and bottom steps will further prevent it from pulling out of shape. A little paraffin on the ways will improve the sliding qualities.

The stairway disappears by sliding it up the ways until the bottom is some distance above the lower end of the panel. Somewhat more than half of the stairway should project into the air and should be slightly more than sufficient to counterbalance the weight of the panel and bottom of the steps. To fasten the stairway when it is pushed to the proper height, and keep it from falling, a spring hook is provided, as shown in the detail. It works automatically when the stairway is being put away, but must be released by hand when the stairs are being lowered for use. When they are fastened by this hook, the panel tends to rise, being pulled upward by the weight of the upper end of the stairs. By means of the chain, which should have some sort of knob at its end, the panel is held as it moves into place. No catch or fastening is necessary to hold it there, as the counterbalancing weight of the stairs accomplishes this purpose.

Being a stairway which is as easy to ascend as an ordinary one, and yet taking up no more space than the trapdoor and ladder so frequently found, the construction may be very useful for reaching almost any upper story if access is not necessary in the daytime, but only at night for sleeping purposes.

Shoe Shining at Home Made Easy by Handy Outfit

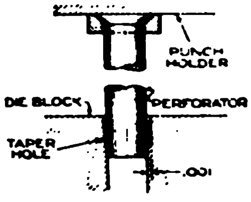
One of the needless luxuries for which Americans spend enormous sums of money is that of having their shoes shined at a public shoe-shining parlor. It is well to remember that shining one's own shoes means no loss of time, but rather a saving of time, as there is no waiting and no delay if everything is handy. A rack, such as illustrated, makes this surprisingly easy. Either foot is placed on the outer rail and all brushes and material are then within handy reach. The posture can be shifted as found convenient, to give access to the rack, and clearance for the polishing cloth.

Improvised Electromagnet Picks Wrench from Crankcase

A wrench which had been accidentally dropped into the transmission case of a car, seemed to be almost impossible to recover without tearing down part of the transmission. It was recovered quite easily in this way: A ½-in. bolt, 15 in. long, was wound with about 15 ft. of insulated copper wire, and four dry cells, in multiple, were connected to this coil. At the cost of a few seconds of ruinous service on the cells, an electromagnet was formed, so powerful that it lifted the wrench from the transmission case and saved a big job of tearing down and reassembling.—John H. Thies, Cedar Falls, Iowa.

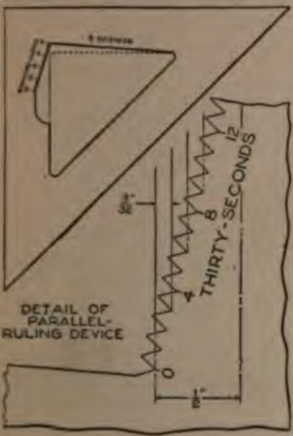
Keeping Small Punchings from Sticking to the Perforator

In perforating, on the punch press, holes in very thin stock or of very small diameter, one important source of trouble is that the punchings have a tendency to stick to the end of the perforator, and be carried along the stock to the next hole to be punched, where they do much damage. The trouble can be obviated by the use of the compound type of punch and die, but these are expensive. A cheaper method is to ream out the hole in the die to a slight taper at the top, so that it is about .002 in. oversize at the cutting edge. The perforator is made just long enough



to reach down beyond the end of the taper. The punching will then be wedged tightly in the die hole, and will not adhere to the perforator. There will, of course, be a slight burr turned up around the punched hole, but this will be removed in the tumbling operation commonly performed on this class of parts.—S. B. Royal, Reading, Pa.

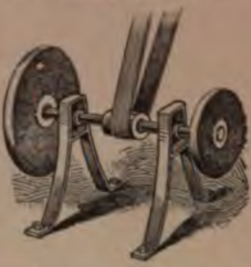
Useful Kinks for Improving the Draftsman's Triangle



The ingenious draftsman can make on his triangle many little improvements which will facilitate his particular line of work. Two such kinks are shown in the illustration. Each shop usually has its own rule as to draft angles in castings, these being usually from 5 to 10°. One of the inside edges of the triangle may be dressed off with a knife, chisel or file to this angle; and by turning the triangle to a suitable position, one can then readily draw these lines with the proper slant.

Another useful kink is to dress off another of the interior edges to a somewhat steeper angle, and file notches of uniform depth at equal intervals along the edge. These are quite useful in section-lining and in drawing lines for lettering, as the lines are easily spaced the same distance apart. In determining the position of the notches, the triangle should be placed over two lines, which are drawn ¼ or ½ in. apart, and the part of the slanted edge which comes between the two lines should then be divided into 8, 16, 25 or 50 equal spaces, as preferred. If notches of equal depth are made at these points, then, by setting the pencil in the notches and sliding the triangle along, lines can be readily drawn at a distance from each other of any desired number of thirty-seconds or hundredths. Figures can be scratched onto the triangle, making an enlarged scale along this edge of the triangle.

Shafting Hangers Converted into Neat Bench Buffer



Many shops where the position of overhead shafting has been changed, can find use for a pair of shaft hangers, which may have been left over, to fit up a bench buffer. A short piece of shafting is mounted, as illustrated, with collars and setscrews to keep it in place lengthwise, and buffing or polishing wheels are mounted on the two ends. It is not desirable to run a heavy emery wheel at high speed on ordinary shaft hangers, as they are not built for such service, but for buffing and polishing of various kinds the arrangement does very well. The cost of construction is practically nothing, as no material need be purchased.—Ernest Schwartz, Brooklyn, N. Y.

Boiling Potatoes to Loosen Boiler Scale

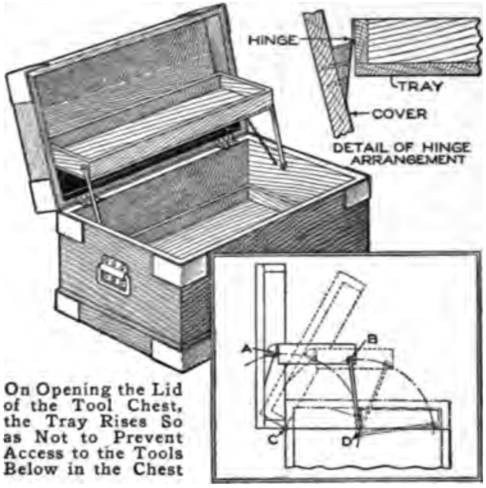
A 40-hp. steam boiler was kept clear of scale for over 20 years by the simple process of placing in it at intervals a bushel of potatoes. It was found that after these were boiled for a time, the scale loosened and collected in the bottom of the boiler, where it could be easily removed.—T. J. Hubbard, Mendota, Ill.

Sawing through Plaster Walls

When cutting an opening for a doorway through a plastered wall, the usual result is a number of cracks in the plaster, some of them projecting beyond the part to be covered by the door casing. Owing to the hair used in the plaster to make it stick together, the saw mutilates it badly, sometimes tearing out large pieces. This can be diminished by nailing two stiff boards to the plaster, with room between them for the saw, and working the saw between these two boards.—W. H. Sargent, Rutland, Vt.

Tool-Chest Tray Rises When Lid is Opened

A tray built in the lid of a tool chest, which remains level at all positions of the lid, is a very convenient place to keep small tools or articles which are used quite frequently. The tray should not be much wider than half the width of the chest, or it will be more difficult to get at the tools in the main part of the chest.



On Opening the Lid of the Tool Chest, the Tray Rises So as Not to Prevent Access to the Tools Below in the Chest

In order that the tray remain level, the four hinge points, A, B, C, and D, must form a parallelogram; that is, the distance AB must be equal to CD, and AC to BD. Since D must be below C, in order to give the screw at D a firm hold in the side of the chest, B must be set the same distance below the level of A; and because D can be only a short distance below the level of the edge of the chest, the links which support the tray should not be used to keep the lid from falling back; a chain or separate sliding link should be used for this purpose.

Readers who are interested in geometrical puzzles may find it interesting to figure out the conditions under which A and B could be placed in the same horizontal plane, with D lower than C, and still have the tray level in both open and closed positions.—Eino E. Lakso, Fitchburg, Mass.

Pocket Mirror Is Useful in the Shop

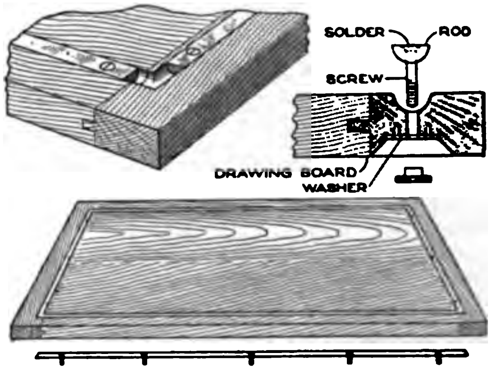
A small pocket mirror is a very handy thing in the shop. Either daylight or artificial light is thus easily reflected into a dark corner or into a blind hole. When the lamp attached to a lathe or other machine cannot be adjusted to a proper place for seeing the work, the mirror may often help out. Similarly, if a deep flask in the foundry is to be examined, a mirror is much handier than a torch.—Edwin J. Bachman, Fullerton, Pa.

Fastening Drawing Paper Tightly to the Board

When a sheet of heavy drawing paper must be held very tightly to the drawing board, a common method is to wet it thoroughly and paste the edges to the board. Then, when the paper dries, it will contract slightly and will be stretched very tightly on the board. This tension is so great, however, that unless the paste holds very firmly, the paper will be torn away from the board, and the process must be repeated.

The sketch shows a board arranged with the idea of avoiding this trouble. Four bars of half-round iron are laid into grooves, cut to fit them, around the edge of the drawing board. The sheet of drawing paper should be large enough to project an inch, or more, in all directions beyond these grooves. The corners of the sheet are then cut off diagonally, and the four edges of the sheet are forced into the grooves under pressure of the half-round bars. The bars are held down by screws, soldered into them at intervals of a few inches, which project through holes made in the board. On the lower ends are fitted brass thumb nuts, such as are used extensively in electrical work.

With this arrangement, the paper can be clamped very tightly even without wetting it; there is no reason, however, why the paper may not be wetted and then clamped with the rods, if this is found to give better results with the particular quality of paper used.

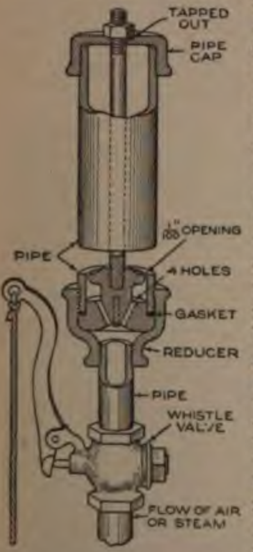


By Means of Four Bars of Half-Round Steel, with Machine Screws Soldered In, the Drawing Paper is Clamped Very Firmly to the Board in a Few Seconds

Used Oil from Auto Engines Makes Good Fuel

When the lubricating oil in the automobile engine is changed, the old oil, although it has lost its usefulness as a lubricant, still makes an excellent fuel. A good way to utilize it is by soaking it up into paper or shavings, and pressing these, if possible, into compact shapes. Care must be taken to guard against spontaneous combustion, and to protect the oil-soaked material in every way possible from fire danger.—Parke L. Shee, Oak Park, Ill.

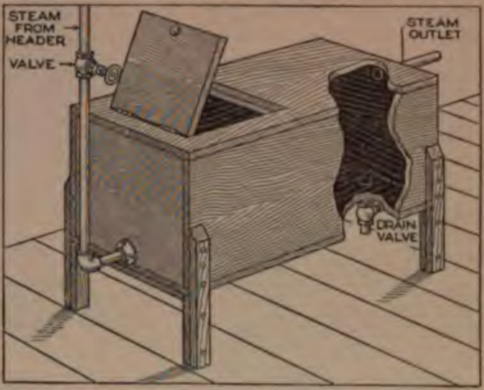
Steam Whistle Made from Pipe Fittings



A small shop, which does not require the daily use of a steam whistle, may nevertheless desire it greatly on special occasions, such as for celebration purposes. Even though steam pressure may not be available, compressed air, as maintained for inflating tires, is equally useful. A whistle can be made almost entirely from pipe fittings and scraps of iron. Only one part need be turned in the lathe, namely, the irregular part contained within the reducing coupling. It should be turned to allow an opening of not much more than .01 in. between it and the short piece of pipe by which it is surrounded. The tone of the whistle depends on the length of the upper pipe, and 3 or 4 in. will be found a useful length. The whistle valve may be purchased, or, for occasional use, some other form of valve may take its place.—Charles Springer, Detroit, Mich.

Mechanic's Clothes Laundered by Exhaust Steam

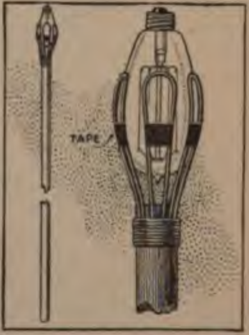
In a shop where exhaust steam was plentiful, a mechanic built a box, with a lid for closing it tightly, connected to a pipe which led through a valve to the exhaust-steam line. Soiled overalls or shop clothes are thrown into the box, and the steam is turned on. A small pipe was provided as a steam outlet, and another to carry off the condensed steam from the bottom. It was found that, after remaining in the box for a few minutes, the overalls were quite well cleaned. After removal from the box, they were rinsed in cold water, and the box was ready for the next batch.—Roy H. Poston, St. Francois, Mo.



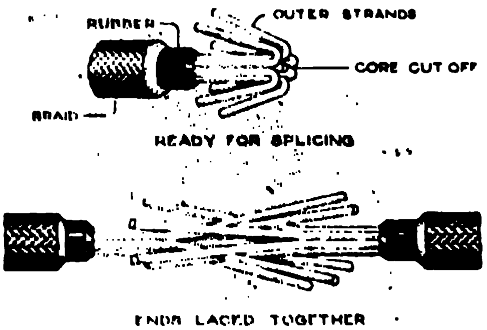
A Mechanic Built His Own Steam Laundry for Cleaning His Overalls, Making Use of the Exhaust Steam from the Shop Engines

Replacing Incandescent Lamps in Lofty Ceiling Fixtures

A useful tool, for removing blown-out electric lamps from high ceiling fixtures and replacing them with new ones, was made from a long pole with wire loops firmly attached to the end. The loops of spring wire were so shaped as to slip over the end of a lamp of the size used and hold it firmly. Each loop was wrapped, at the point where the lamp diameter was largest, with insulating tape, which created friction between the tool and the glass, so that the lamps could be loosened even if screwed in quite tightly. A tool of this character can readily be made jointed, to reach fixtures of various heights, and will save a great deal of the time otherwise spent in bringing ladders and climbing upon them to reach the lamps.—Dale R. Van Horn, North Loup, Neb.

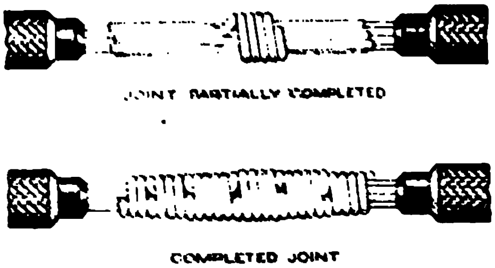


Splicing Stranded Wire



The Strands are First Bent Back, So That the Core may be Cut Off, and Are Then Interlaced

Almost any practical man can make a splice, between the ends of two stranded electric conductors, which will carry the current, but comparatively few know how to make quickly a strong splice which will have a neat, businesslike appearance. The successive steps of the process are shown in the sketches. The first step is to "skin" the wire, and sandpaper it until it is bright, removing all the rubber and other insulation from the conductor. Next the ends of the outer strands should be bent back to expose the core, which should then be cut off. The outer strands are now forced back almost to their normal position. The two ends to be connected are laced together, so that the end of each strand comes between two ends from the other conductor. Proceeding, each one of the free ends is wrapped around the main conductor, taking all strands of each conductor in their order, going around the joint, and wrapping each one around as many times as it will go. Each strand should be cut off where it meets the next strand to be wrapped, as indicated in the lower sketch, so that there will be no incomplete turns of wire.

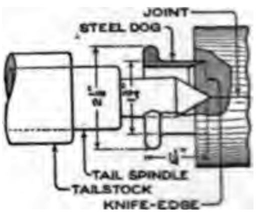


The Strands are Wound Around, One after the Other, Forming a Joint of Great Strength

To solder the joint, the molten metal should be poured with a ladle, so that it will drain into the solder pot through and around the joint, until the joint becomes hot enough so that the solder will permeate it and stick to it effectively. After the joint has thus been uniformly heated, and appears to be "tinned" over its whole surface, a wet piece of waste can be held on it to cool it quickly. Tape servings around the joint, to the thickness of the insulation of the original wire, complete the splice.—E. D. Hunt, St. Louis, Mo.

Holding Split Patterns in the Lathe

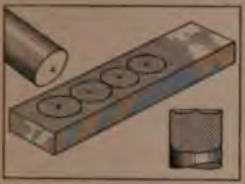
When a pattern maker wishes to do a quick job of turning up either one or both halves of a split pattern, he often makes use of small "pinch dogs," which are driven into the pieces to hold them together. These dogs are not always very satisfactory, and are dangerous, as they may fly out at high speed. One pattern maker uses circular dogs of the type illustrated on both live and dead centers of the lathe. One of the dogs is driven into each end of the wood; the one at the dead-center end revolves on the dead center, while the other revolves with the live center. The flange around the dog aids in withdrawing it after the work is completed. It is well to caseharden the sharp edge.



To Dry a Lens Properly

Surveyors often find their instrument lenses fogged in cold weather, due to moisture condensing upon the cold crystals. It should not be wiped off, as this in time injures the polished surfaces, but should be evaporated by gently warming the lens. Especially is this necessary when the inner surfaces become fogged; they will soon clear if the instrument is set in a warm room. This is seldom practicable, however, but if the objective end of the tube is grasped in the bare hand, in a few minutes the lenses will be dry and clear. Never put any lens near a stove to dry, as even a moderate temperature may injure the cemented joint and ruin the lens.

Punch for Laying Out Drill Holes



When laying out a row of holes for cutting out a piece of metal, as in die work, it often requires a great deal of practice to be able to space the holes accurately. A special punch which makes this work much easier can be made from a piece of drill rod the size of the drill to be used. Shape the end, as shown in the illustration; then harden and temper the piece for use as a punch. The manner of using it is evident from the illustration; the small center marks can be deepened with an ordinary center punch before drilling, if found convenient. —J. H. Beebee, Rochester, N. Y.

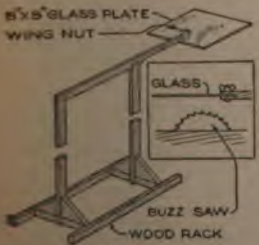
THE THOUSANDTH OF AN INCH

By Thos. A. McMahon

At night I sit and ponder
  On the thousandth of an inch;
I knit my brow, and scratch my head,
  And then my fists I clinch.
O show to me the man, sez I—
  If Irish, Dutch, or Frinch—
The man who first invented
  The thousandth of an inch!

When finally I crawl in bed,
  So thankful for a snooze,
I drive my sorrows all away
  Without the aid of booze—
I dream that they have caught the man,
  And him they now will lynch,
By jinks! The man who did invent
  The thousandth of an inch!

Glass Plate over Buzz Saw Protects Eyes

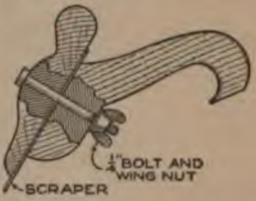


When a buzz saw begins to get dull, it usually throws sawdust quite badly into the face of the operator. One user of a buzz saw found it convenient to have handy a pane of glass mounted on a frame, as illustrated, so that the glass could be placed directly over the saw, to shield the operator's face. The utmost care must, of course, be taken to make the frame solid and steady, so as to prevent the glass from coming into contact with the saw. — Frederic Doremus, Passaic, N. J.

Homemade Concrete Tombstone

The photograph shows the splendid results obtained in making a tombstone of concrete with no special equipment. A mold was made out of ⅞-in. lumber, in four parts, for the four sections of the tombstone. The letters were cut from cardboard, and fastened to the side of the mold, reading in reverse so that they would be in the correct order on the stone. The concrete was mixed, using one part cement and three of sand, and was poured in from the top. It takes about three weeks for such a stone to dry, but if well made, it is scarcely less durable than a marble stone, and makes an appearance which is not at all unpleasing.—James F. Welliner, Danville, Pa.

A Handle for Scraper Blades

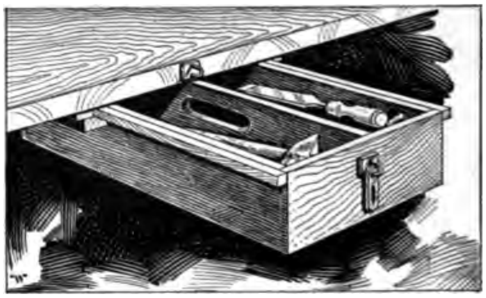


Scrapers for wood are widely used without handles, the blade being held directly in the hands. While this is hard on the fingers, especially of an inexperienced man, it is necessary, chiefly in order to get into corners where a handle would be in the way, or would interfere with holding the scraper at the proper angle. A carpenter, who uses on his scrapers the handle here illustrated, finds that it gives very little trouble in this respect, and saves soreness of the fingers when there is much of this kind of work to do. The handle is cut from hard wood, ⅞ in. thick, and the backing block is rounded off smooth at the top to allow a firm hold by the left hand, giving plenty of pressure against the work.—Benj. W. Bush, Keyport, N. J.

¶All bearing surfaces in machinery should be as large as is practicable, insuring against undue wear. Compensation for wear should also be provided for.

A Portable Tool Drawer

A carpenter who works in a plant where he has to carry his tools around frequently to various locations in the shop, fitted up a box which serves either as a drawer for his workbench or for a tray to be carried. When in its place under the bench, the drawer is readily locked with a padlock over the hasp shown. When the carpenter starts out to work in another part of the plant, he merely takes out the drawer, catches it by the handle in the middle partition and carries it with him.—Chas. H. Willey, Concord, N. H.



Transfer of Tools from the Drawer to a Portable Tray is Avoided by Combining the Two Receptacles into One, Which Serves the Purpose of Both

Proper Placing of Three Hinges on a Door

When three hinges are used on a barn or garage door, they are usually placed equidistant; the third hinge, being midway between the other two, is then of little use except in restraining any tendency of the door to warp. It does very little good toward supporting the weight of the door, and on doors where warping is not to be feared, it will make a better job if the third hinge is placed directly underneath the upper hinge, as this is where its strength will count the most. The appearance may not be quite so symmetrical, but the door will work longer without attention.

Lead "German Soldiers" Used as Targets

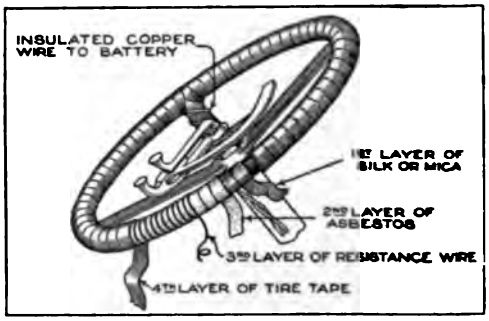
The enterprising owner of a public shooting gallery set up for targets, instead of the ordinary figures of birds or fowl, a line of small German soldiers made of lead. Every successful shot broke up one of these soldiers, but the pieces of lead were caught up in a net and were readily recast.—Philip A. Wall, *Bedford, Mass.*

Saving Fuel on the Gas Range

A kink which will save gas in the kitchen is the use of a large piece of sheet iron, to be placed directly on top of the stove when there are several utensils to be kept warm. The sheet-iron plate conducts the heat from one burner and distributes it to the others so that only the one burner need be kept lighted. The sheet-iron slide which many stoves have under the burners to catch dirt, if easily removed, will be quite satisfactory for this purpose. No great amount of heat will be conducted to the vessels indirectly over the fire, but there will be sufficient to keep the contents warm enough for eating.—G. A. Luers, Washington, D. C.

Electric Hand Warmer for Automobile Steering Wheel

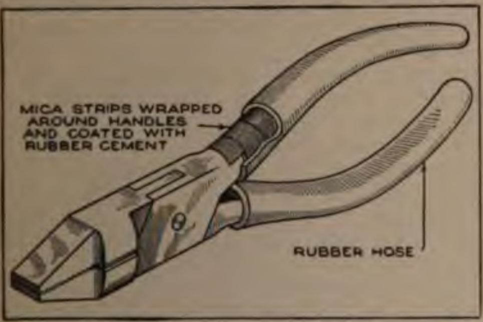
One of the simplest electrical conveniences to make for the automobile is an electric hand warmer. On the half of the steering wheel that comes toward the driver's body, or where he will grasp the wheel, wind a layer of heavy silk cloth. Mica will do just as well, and if one is sure the wheel will never become wet, no silk layer is necessary. Next, cut some asbestos in strips, and wind it over the silk. Then wind some resistance wire carefully upon the asbestos, with each turn ¼ in. from the next, being careful that no two turns touch. Over this wind tire tape, extending it also over the other half of the wheel, for the sake of uniform appearance. To the ends of the resistance wire connect insulated, stranded copper wires, that reach down the steering post to a connection with the storage battery of the car. Place a switch in the line so that the circuit can be broken. A good enough resistance material for this purpose is bare iron wire. For six-volt bat-


INSULATED COPPER WIRE TO BATTERY
1ST LAYER OF SILK OR MICA
2ND LAYER OF ASBESTOS
3RD LAYER OF RESISTANCE WIRE
4TH LAYER OF TIRE TAPE

A Little Electric Current from the Storage Battery on the Car, Passing through Resistance Wire Wound on the Steering Wheel, Keeps the Driver's Hands Warm on the Coldest Days teries, 30 ft. of No. 20 gauge iron wire will do; for 12 volts, about No. 23 should be used. The wire should become only moderately hot; this can be determined in each particular case before the tire tape is permanently wound in place.—F. E. Brimmer, Dalton, N. Y.

Insulating Handles for Pliers and Other Tools

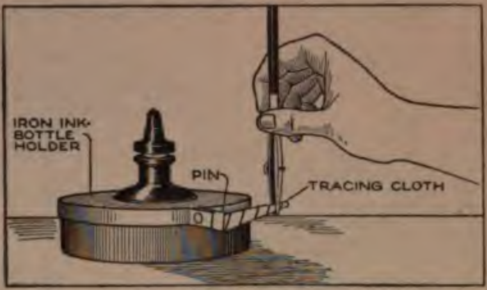
In order that the electrician may work with safety on wires carrying high voltage, the handles of his pliers, and other tools, are often insulated with tape or wood. These materials do not form a satisfactory insulation against any considerable voltage, except when dry and in good condition. Those who wish a better quality of insulation may use this method: Give the handle a coat of shellac, and wind around it strips of mica; over this give a coat of rubber cement, such as is used for repairing automobile tires. Before the cement gets too hard, slip over it a piece of red-rubber tubing (not fabric hose) with walls about ⅛ in. thick. When the cement has hardened, it will hold the rubber tubing firmly in place. One reason for selecting red-rubber tubing rather than white is that it makes the tool much easier to distinguish on a bench, which may be full of other tools and white-porcelain articles. The outer ends of the pieces of rubber tubing should be vulcanized together, or stitched with stout thread, in order to protect the hands.


MICA STRIPS WRAPPED AROUND HANDLES AND COATED WITH RUBBER CEMENT
RUBBER HOSE

Rubber Tubing Cemented on the Handles of the Pliers, with a Layer of Mica Between, Gives a Real Insulating Handle

Pen Wiper for Draftsmen

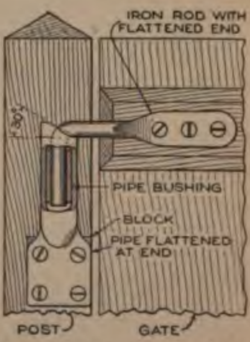
Much time can be saved in the drafting room by providing means for wiping out the pen with one hand, while lifting the cork from the ink bottle with the other. Filling the pen is an operation which must be performed so often that this slight saving is of considerable value. A convenient arrangement for this purpose consists of a band of sheet brass around the bottle holder, fastened with a small screw. The projecting end is wrapped with absorbent linen, such as may be produced by washing out scraps of tracing cloth in hot water. A pin is clamped in near the screw, so that the end of the strip of linen will catch on its point and be prevented from unraveling. The pen is wiped with a movement of one hand, as illustrated, the weight of the bottle holder preventing its being lifted off the table.—Q. J. Workman, Cleveland, Ohio.



Much of the Tracer's Time can be Saved if He can Clean Out and Fill His Ruling Pen with One Hand, Leaving the Other Free to Uncover the Ink Bottle

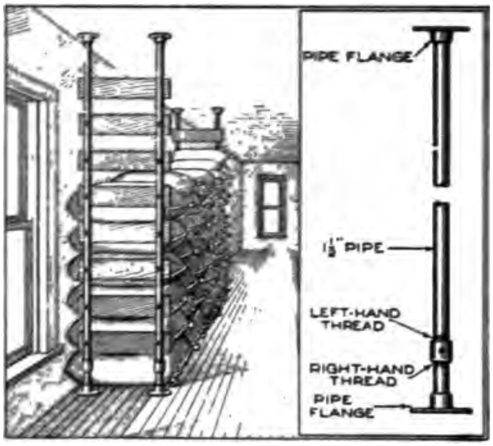
Springless Self-Closing Gate Hinge

A very simple hinge for the farm gate, which possesses great strength and durability, consists of two pieces of pipe and a piece of round bar bent to a right angle. The short piece of pipe should be driven into the larger piece, the lower end of which is flattened and fastened with screws to the post. The upper end of this piece of pipe should be beveled off at an angle of about 30°, so that, as the gate is opened, it will be lifted slightly and its weight will tend to close it without the use of any spring. It is not always necessary to have the two pieces of pipe, but it makes a much stronger and more durable hinge, as the rod does not need to be bent at such a sharp angle, and the larger pipe will cause less strain on the screws which hold the flattened pipe in place.



Movable Posts Made of Pipe Useful in Stock Rooms

The sacks in the picture are held between movable posts, each made of two pieces of pipe, two flanges, and a coupling. At the coupling, both pieces of pipe are threaded with a straight thread, not a pipe thread, one being right-hand and the other left-hand. The coupling is threaded internally, to correspond with these, and is adjusted like a turnbuckle, a hole being drilled through the center of it, to take an iron rod, as a wrench. To move the posts from one place to another, it is only necessary to loosen this coupling, move the posts, and again tighten it up.



Movable Steel Posts, between Which Stock can be Piled Up, will be Found Useful in Many Factory Stock Rooms

Repairing a Cracked Water Jacket with Cement

A 10-hp. gasoline engine suddenly developed a crack in the water jacket, and was put out of commission. As the location was far from a repair shop, an emergency repair was attempted with cement. It was found that by having a rough boxing built around the cylinder and a few inches above it, and pouring in a mixture of 1 part Portland cement and 3 parts sand, with a few iron bars laid across it to prevent cracking, the crack was plugged so that no water leaked. After the cement had dried, the engine ran as well as ever.—H. S. Rich, Cromwell, Conn.

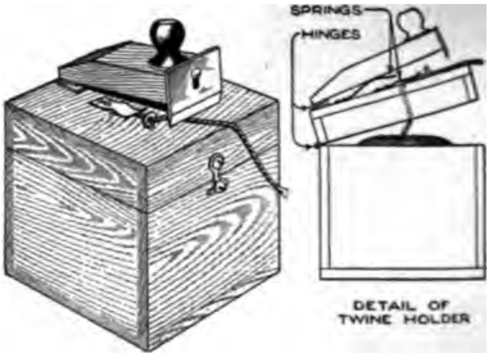
¶Where rubber gaskets might be objectionable, as on cooking utensils, tin foil is very useful for the purpose.

Lighting a Fire at the Top Saves Fuel

Although a coal fire always burns better, especially at the start, when lighted from the bottom, it has been found to be much more enonomical of coal if the paper and kindling wood are placed above the coal. A few small coals and cinders are spread over the top of the kindling wood to enable a coal fire to be started. After the top layer begins to burn properly, the fire will spread slowly downward, if the air draft is right. This method secures the most complete combustion, because the gases from the unburned coal at the bottom must pass through the burning layer at the top, and thus become completely burned. It is admittedly harder to build and control this kind of a fire, but the saving in fuel often justifies the extra trouble.

Handy Twine Holder and Cutter

To make a very convenient holder and cutter for twine, place the ball of twine in a wooden box, with the end coming out through a hole in the lid, over which a flat spring is fastened so as to hold it from slipping back into the box. From this spring the twine comes out under the knife, which may be made from a piece of a saw or a safety-razor blade. The knife is mounted on a block which works on a hinge, as shown. Another flat spring is mounted under the block, to keep it away from the twine while it is being drawn out. To cut off the twine, simply strike the knob on top with the hand, bringing the knife down on the twine. The knife should be removed and sharpened when necessary.—Chandler H. Montgomery, Piqua, Ohio.



A Great Convenience in Tying Up Packages Is a Twine Cutter, Which Never Gets Lost and can be Operated by Striking the Hand against a Knob

Scored Cylinders Repaired by Soldering

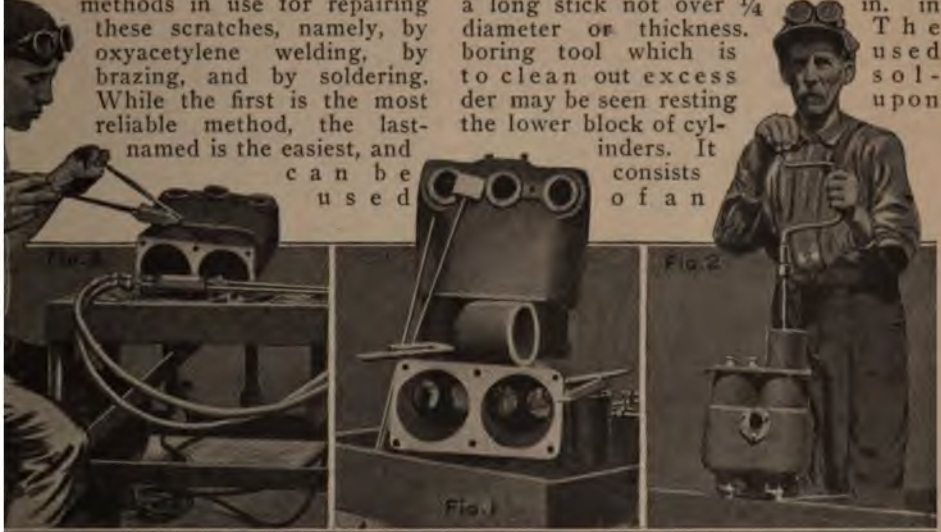
By DAVID BAXTER

PAIRING scored cylinders in automobile engines is a somewhat difficult and one which requires some skill, by ever method it is attempted. Until ntly, it was considered that cylinders h were badly scored required reborand fitting with oversize pistons. ever, there are now at least three methods in use for repairing these scratches, namely, by oxyacetylene welding, by brazing, and by soldering. While the first is the most reliable method, the last-named is the easiest, and can be used e the apparatus necessary for either ne other methods is not available.

e soldering method may, however, use of some of the same apparatus used in welding, if this is available. welding torch may be used for heathe soldering copper, and the cylinder ld be heated preparatory to soldering, ne same way as for welding, except the temperature required is not so

e tools needed are shown in Fig. 1. ing against the top cylinder casts the soldering copper, which conof a small piece of copper, faston the end of a long iron rod, about . in diameter and 18 in. long. The copper itself is ½ by 1¾ by 2 in. in size. It is bent or curved to fit the inside of the cylinder. The surface is polished and tinned. Beside the soldering copper stands the stick of solder. This is ordinary half-and-half tin-lead solder, with a little more tin added. For this purpose it should be cast into the form of a long stick not over ¼ in. in diameter or thickness. The boring tool which is used to clean out excess solder may be seen resting upon the lower block of cylinders. It consists of an old piston sawed off at the solid end, with a shank attached to a pin in the piston-pin holes. The other end of the piston is notched clear around, so that it cuts out the excess solder. The glass to the right contains the solution with which the surface of the steel is cleaned before tinning. A good solution consists of equal parts of blue vitriol and sal ammoniac, dissolved in water.

The process is as follows: First clean thoroughly the scored place, and a strip 1 in. or so wide on each side of it, with emery cloth or steel wool. Then place the scored cylinder over a gas burner or suitable heater, until it is warm enough to fry the soldering solution. Don't get it



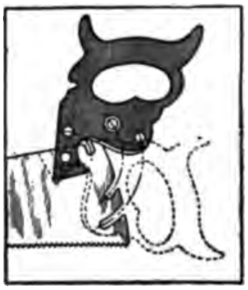
can be Used for Filling Up Scored Places in Automobile Cylinders and for Repairing Cracked Water Jackets. The Apparatus Required is Not Expensive hot enough to crack the casting. While this is being done, the special soldering copper should be heated. Get it hot enough to melt the solder, but not so hot as to spatter it. As soon as the copper and cylinder are ready, apply the solution to the scored surface, making sure that every portion of it is moistened with the liquid. When dry, fill the score with melted solder by inserting the stick of solder into the cylinder and putting the hot copper against it. After the score is entirely filled with solder, allow the whole thing to cool; then reheat the copper and smooth out the solder. Work the copper back and forth or sideways like a trowel, until every crevice is full of solder. Allow the cylinder casting to cool again, and then employ the hand borer, as shown in Fig. 2. The boring tool should fit the cylinder quite snugly; if it is too loose, it may be possible to peen the inside of the piston surface with a ball-peen hammer even all around, so as to expand it.

The reliability of this method depends upon the thoroughness with which the solder is applied to the scored portion. Sometimes it is necessary to reheat the soldering copper several times during the process. Either a welding torch or a common tinner's blowtorch, will do, or even a common gas burner, though the work will then be slower. After the cylinder is bored out, it is sometimes necessary to polish the solder with waste or with a scraping tool. The soldering method is not recommended as equal to the welding process, but it is particularly valuable on rush jobs where the customer cannot wait for welding, or where there is no welding shop which is equipped to do the work. When welding cylinders, it is sometimes necessary to put in new pistons, as the cylinder has to be bored oversize; with the soldered cylinder, the old pistons can be used.

The question which will occur to the mechanic is whether a soft solder can be relied upon to remain solid under the temperatures prevailing in an engine cylinder. This is unquestionably the weak point of the method, but it should be remembered that the lower part of the cylinder, where the worst scores often occur, does not get so hot as the combustion chamber above, and that in any case the inner surface of the cylinder does not reach anything like the temperature found at the center of the piston head, unless the cooling system is allowed to run dry. But in deciding whether to apply the soldering method, the location of the scores should be considered, as well as the probability of the engine being used under conditions which would cause it to heat up greatly.

Figure 3 shows another application of the soldering method, namely, repairing a crack in the water jacket of a cylinder casting. This is not recommended for great reliability, but it is often useful in a pinch. The process is very similar to that described above, except that the common soldering copper is used. The line of the crack is cut out to a V-shaped groove, as for welding. This groove is made with a cold chisel, almost to the full depth of the metal's thickness, and about ¼ in. wide at the top. The groove is painted with the acid solution; it is then filled with melted solder and smoothed down with the soldering copper. Again, the chief requirement is to see that the soldering powder is thoroughly stuck to the iron. The appearance of such jobs is very neat, but although they have been known to give satisfaction for months, the repairing should not be regarded as permanent. The upright casting in Fig. 1 shows such a repair to the water jacket. Along the right and lower edges of this casting can be seen the white marks which are the only visible indication that the soldering process has been applied.

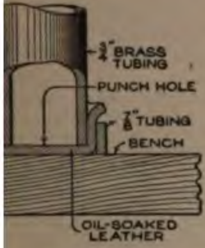
Sharpening a Worn-Down Saw



Many carpenters, especially those who have been at the trade for some time, number among their tools a saw or two which, through many filings, are worn to half their former width. The handle is thus in the way of the saw-filing clamp and must be removed for filing, or at least three or four screws must be removed to permit the handle to be turned back. This consumes time, and, since each screw consists of two parts, often results in the loss of a needed and not easily replaced screw. An easy way out of the difficulty, and one which does not harm the saw in any way, consists in enlarging the holes of all except the uppermost screw to notches leading to the edge of the saw blade, these notches being shaped in conformity with the circle traced by each w when the handle is pivoted on the at the top. This is easily done by oving all but the pivot screw and ging the handle about on it, while a il is held against first one, and then opposite side of each screw hole, marking the path of each over the e. The slots can then be cut out, fol- ng these marks. To get a saw thus ared ready for filing, it is only neces- to give each screw a half turn and g back the handle.—Henry Simmons, Angeles, Calif.

ing Gasoline-Torch Piston Leathers

ston leathers for gasoline torches can ade as indicated in the illustration, by g a short length of ⅞-in. thin brass ng as a form, and then driving a piece il-soaked leather into it with a section of ¾-in. brass tubing, used as a punch. Place the piece of ⅞-in. tubing, which should be about ¼ in. high, on the top of the bench. Lay a piece of leather, the same thickness as the old one, over the top he ⅞-in. tube. By forcing the ¾-in. down, as shown in the picture, the ner will be molded into the form re- ed. It can then be trimmed off evenly nd the top of the ⅞-in. tubing ring. leather should be permitted to re- n in the form for a few hours, or night if possible, after which it will in the required shape. A hole should unched in the middle of the piston ner to accommodate the screw which s it to the piston head. If, after using, piston leaks, soapsuds should be red around it rather than gasoline. If line is used, it will dissolve the oil on piston leather and spoil it.—L. M. e, St. Louis, Mo.

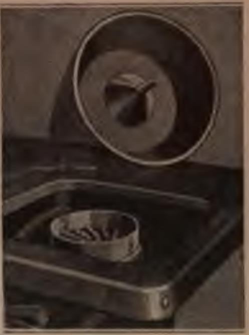


Old Linen Collars Make Good Marking Tags

rom discarded linen collars, excellent n labels, or tags, can be made. The ed surface which comes about with repeated starching makes an excel- surface to write upon. A hole is ched at one end, through which a t length of string is twisted. Labels e in this way are very durable, and not pull away or tear.

Saving Gas in Heating Water

A vessel which will heat water on a gas stove more quickly than will an ordinary pan or kettle, and which will for this reason save gas, can be made by soldering an inverted funnel into the bottom of a tin pan. Nearly the whole portion of the bottom of the pan that is covered by the funnel should be cut away, so that the hot gases from the flame can go up through the funnel as well as around the sides of the pan. It is this double heating that makes the vessel efficient.—Harvey Mead, Scranton, Pa.

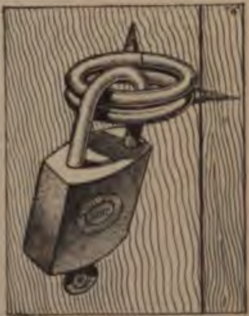


Salt in Whitewash

Where it is customary in the summer months to whitewash hothouse or greenhouse windows to keep off some of the hot rays, it is necessary to clean the windows in the winter time, and it is usually hard to remove the old covering. By putting one gallon of common salt in a barrel of whitewash, a mixture will be made which can be removed easily.

Screw Eyes Carry Padlock

In applying a padlock to a door, the main requirement for the hasp is that it should be fastened in such a way that no screws are exposed when the lock is on; otherwise the lock can be removed by taking out the screws with a screwdriver. An equally effective method of applying a padlock, which does not require the use of a regular hasp, is to insert two screw eyes in the position shown; one in the door, and the other in the door jamb, so that they come close to each other when the door is closed. When the padlock is attached as shown, the screw eyes cannot be unscrewed.—J. H. Norrell, Augusta, Ga.



Testing Seed Corn for Germination

By H. A. FRANKLIN

THE average yield of corn throughout the United States is not far from 28 bu. per acre. There are 4,800 hills of corn to the acre, planted 3 ft. apart each way. Three stalks to the hill and one ear on each stalk would yield 14,400 ears, which, at half a pound to the ear, would make 7,200 lb. or 130 bu. of shelled corn per acre. This is not all theory, for corn-club boys have produced such yields in a dozen different states. The difference between this and the average yield corresponds to the difference between the old-fashioned way of planting by the rule of thumb, and the new way of applying scientific knowledge to the growing of crops.

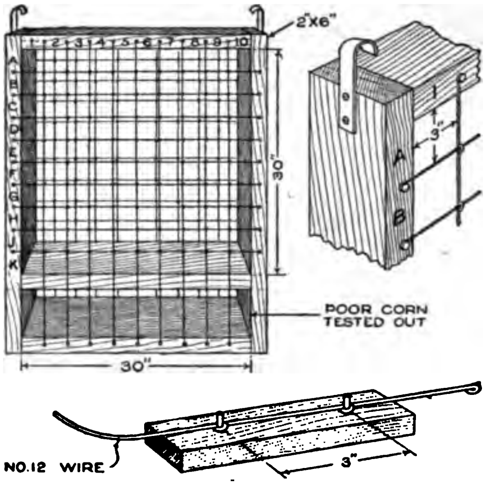


FIG. 1

Seed-Corn Ears are Kept in Racks, Each Numbered and Tagged, While the Kernels from It are being Tested for Germination

The first step in the production of large yields of corn is the selection of seed with strong vitality from the best-producing stalks in one year's field for next year's crop. The best-looking kernels may be dead. Some grains of corn that germinate fairly well show weak roots or sprouts. Stalks grown from such seeds fail to have ears. Leaving out the question of poor soil and a badly prepared seed bed, the two principal causes of low yields of corn are vacant hills and barren stalks, both of which may be prevented by thorough ripening, careful curing, and the final process of elimination by testing the germinating qualities of each seed ear in the incubator. Growing three productive stalks to the hill without any skips, or *the same ratio* when planted in drills, is *too near perfection* to expect, but intelligent effort, with the assistance of modern machinery and laboratory appliances, will always increase the yield.

The seed-curing rack, here shown, will hold 100 ears of seed corn, each ear in a separate compartment, from the day the ears are selected in the field, through the final ripening and curing processes and the testing of each individual ear for germination, to the final selection for planting; and each of the 100 ears will retain its identity throughout the test.

Each ear should have a card fastened to the butt end of the cob, preferably by a thin, blind staple. On the card is marked the number corresponding with the wire pigeonhole that the ear occupies. These numbers will read A1, A2, etc., using the first 10 letters of the alphabet with the exception of letter "I," as shown in Fig. 1. The same system of letters and figures will identify the five grains from any ear while they are being tested for germination.

The incubator cabinet, Fig. 2, completes the equipment for the scientific handling of seed corn, which includes also a permanent record such as modern farming demands for the registration of pure-bred seed. This record is made by marking the date and result of each germination test on the card that is attached to the cob. The cabinet is used in connection with the curing racks, to test the

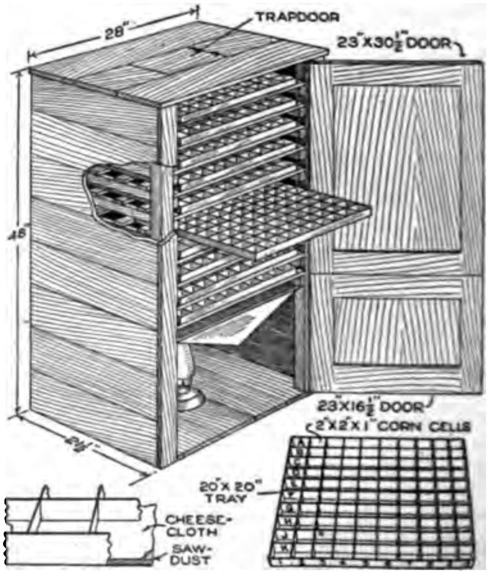


FIG. 2

The Testing is Done in an Incubating Cabinet, Where Five Kernels from Each Ear are Kept Warm and Moist by Steam Generated Below fitness of the different ears for seed. Its capacity is 1,000 ears, or equal to 10 seed-corn racks as represented in Fig. 1. The racks and drawers may be numbered correspondingly from 1 to 10, so that, for instance, 9-J-8 will indicate the eighth compartment in row J of the ninth drawer, containing grains from ear No. 9-J-8, which is placed in the ninth rack, row J, eighth space.

This testing cabinet is 48 in. high, 28 in. wide, and 21½ in. deep. The four corner posts are 2 by 2-in. strips. The cabinet is boxed in with sound ½-in. ceiling lumber of the matched variety. The top is also of ceiling lumber, with a trapdoor in the center. The bottom pair of cleats, on the corner posts, are nailed on 15 in. from the floor. The other cleats are 3 in. apart, as shown in the drawing. These cleats support the shelves, and should be of sound material, 1½ in. wide by ⅞ in. thick. The shelves are made of slats so that the temperature will be more uniform, but they must be level, straight, and true.

The tin deflector is filled with water to supply moisture. It also prevents excessive heating of the lowest pan; it distributes the heat in equal amounts on either side of the lamp, and starts it up at the sides of the cabinet to circulate around each pan alike. The heating arrangement is more or less automatic in that each pan receives an average amount of heat, and the temperatures at various heights are as nearly uniform as is easily obtainable. The temperature should be maintained between 72 and 80° F. The trapdoor ventilator in the top lets out the superheated air when necessary. A good lamp of the incubator style furnishes heat, and is not easily put out of service.

The pans should be of No. 24 gauge galvanized iron. They should be made accurately to size, 20 by 20 in., fitted with nine tin partition strips running each way, thus dividing the pan into 100 divisions, or compartments, each 2 in. square and 1 in. deep. The tin partitions are 1 in. high, and the tin strips are 20 in. long. They are cut to the center at intervals of 2 in., and pushed together like the paper strips in an egg carton, and may be touched with solder at the joints to make the racks hold together. They can then be lifted out of the pans and cleaned with boiling water or live steam, after each test, to kill spores.

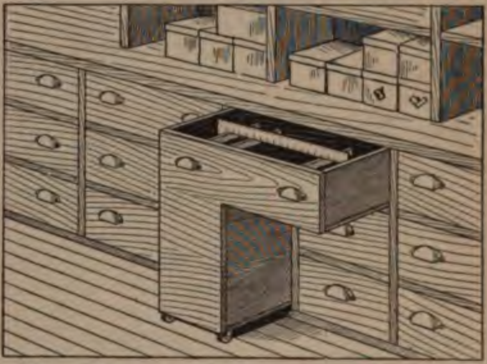
The sides of the various cells are marked on the left with letters and on the front with figures, with a waterproof crayon, the letters and figures corresponding with those on the corn-curing rack. This system positively identifies the five grains in the tester with the ear in the rack.

The front is closed with two doors of the same material as the sides and back; the upper one incloses the pans, while the lower one covers the lamp.

To operate, put warm water in each pan, about ¼ in. deep, and put in five kernels from every ear to be tested in their proper cell. Seeds must have air as well as moisture, so it is better to sift a layer of fine sawdust over the pans, then cover the sawdust with a square of cheesecloth, place the racks in position, and put the kernels of corn on top of the cheesecloth. This cabinet, without the tin racks, may also be used as a sprouter for grain in the winter months, when grain feed is so greatly desired in the poultry yard.

Hardware Store Has Special Drawer for Carpenters' Squares

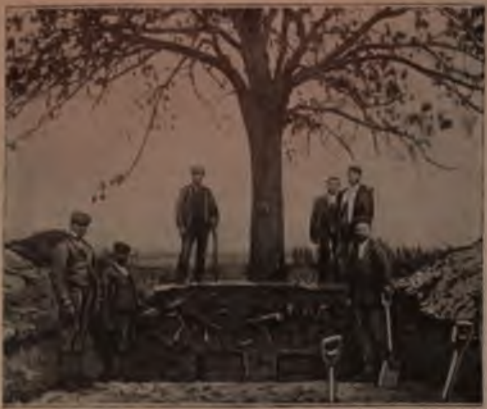
One of the problems of the retail hardware store is to arrange the stock of carpenters' squares so they may be easily displayed, and yet take up as little room as possible. They are awkward articles to arrange, and no little trouble to the clerks. One store overcame the difficulty in the following manner: A drawer was built to conform to the shape of the squares, and was so constructed that it could be easily rolled out of its pocket in the wall case, displaying the entire line of squares at once. The drawing shows how the drawer was built and how the otherwise dead space below the horizontal section of the drawer was used to house a number of small drawers, thus utilizing the entire space.—L. B. Robbins, Harwich, Mass.



A Drawer Especially Built to Accommodate Carpenters' Squares Is a Neat Device in Any Hardware Store

How a Big Tree Is Moved

It has been known for a long time that even large trees can be moved from one place to another without injury. This must be carried out during the natural resting time of the tree, that is, in the winter. The remover of big trees strives at all cost to avoid injuring the roots more than is absolutely necessary, and to this end a square of soil is cut out all around the tree. On one side, an opening, or slipway, is made, as can be seen in the photograph.



By Digging Out the Ground Properly and Providing Runways of Lumber It Is Possible to Remove Large Trees Successfully

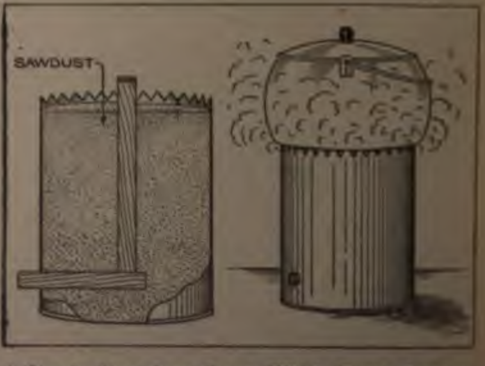
The most difficult part of all is to cut under the tree so as to sever the roots that may have penetrated to some depth in the soil. Several small tunnels are opened up, and from these the separation of the tree from the subsoil is carried out. Planks of wood are slipped under the tree to act as runners on a track which is prepared. The tree is then hauled by horses or, in the case of a very large specimen, by mechanical power. The ropes are placed round the square of earth, as it is dangerous to pull on any part of the tree itself. Before the removal of the tree is attempted, the new position must be ready. Down toward the excavation, a track is cut out so that the tree will travel easily into the new location.—S. Leonard Bastin, Bournemouth, England.

Starting Auto in Deep Sand

A farmer, located in a very sandy country, was sometimes embarrassed because friends who came to see him found that, upon leaving, they encountered a great deal of trouble in getting their cars loosened from the deep sand. After the experience of furnishing to one of his guests a pair of mules and a quantity of heavy planks, he devised a much less troublesome method for the next case. He got from his barn an old horse blanket and spread it on the ground in front of the drivewheels. The difficulty, of course, is the tendency of a heavy machine to bury itself in the sand, by constant efforts to start. As soon as the wheels climb onto the horse blanket, even if they drag it part way down into the sand with them, the burying tendency is checked.—Samuel C. Appleby, Baltimore, Md.

A Stove That Burns Sawdust

A simple stove made of sheet iron, using only sawdust for fuel, will burn a long while on one charge, giving sufficient heat to cook a meal. The stove itself is an iron can, from 6 to 8 in. in diameter, and about the same height. The bottom must be riveted to the sides. A 1-in. hole is cut on one side, 1 in. from the bottom. Around the top of the can, a number of notches are cut, ½ in. deep and ½ in. wide. To start the fire, sprinkle sawdust in the bottom of the can up to the 1-in. opening. In this hole place a round piece of wood long enough to reach a little past the center of the can, and to leave a grasping length outside. Rest a similar piece vertically upon the first one, in the center of the can. Then pack sawdust tightly to the level of the notches in the top. After carefully removing both sticks so as not to jar sawdust into the holes left, stuff a bit of crumpled paper into the 1-in. opening and light. In a few minutes the whole mass of sawdust will glow with a red heat which will last for a long time.



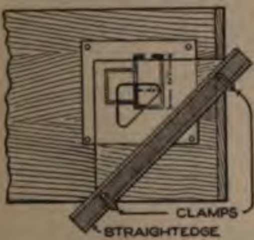
A Simple Sheet-Iron Stove, Which Burns Sawdust, Furnishes Heat Enough to Cook a Meal

Removing Wall Paper with Steam

Stripping wall paper from the walls of a room is a tedious and unpleasant task. The following method has been found to do this work satisfactorily: Remove all furniture from the room and take up the floor covering; place, in the middle of the room, some kind of a portable stove with a big pan of water on top. Light the stove and close all the windows and doors; when the room becomes full of steam, it will soften the paste which has been used for sticking the paper on the wall. After an hour or more of the steaming, it will be easy to remove the paper.

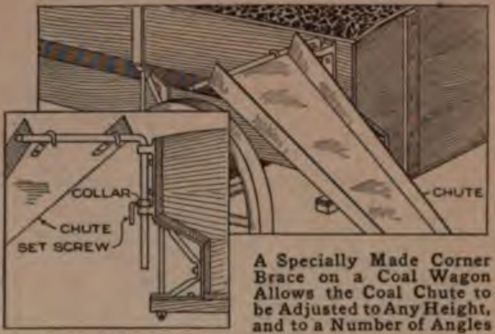
Small Drafting Work Easily Done without a T-Square

Small mechanical drawings, which consist mostly of horizontal and vertical lines, are made most quickly by using, instead of a T-square, a straightedge and the 45° triangle. Clamp the straightedge to the table, diagonally, so that it is below and to the right of the space where the drawing is to be made. Lay the triangle with the long side against the straightedge; the triangle should be large enough so that, as it slides along the straightedge, it will pass over the whole space to be covered by the drawing; that is, the drawing will lie between the straightedge and the line of motion of the vertex of the triangle. If these conditions are fulfilled, all vertical and horizontal lines can be made with the two sides of the triangle; for lines at 45°, 60°, or other angles, other triangles or a protractor will be required, as usual.



Adjustable Chute for Coal Wagon

The ordinary chute used by coal dealers does not always make it possible to fill the customer's bin without carrying. It is often supported by boxes and barrels, but this is not satisfactory. The chute can be made to fit a greater number of cases, and to give better service where used, by making an adjustable support for it on the back of the wagon. This support is really a part of the wagon box, but it allows the chute to be used in a number of positions, and gives it a firmer hold than is obtained by the usual method of hanging it over the edge of the box.

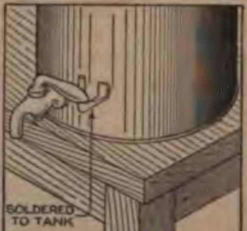


A Specially Made Corner Brace on a Coal Wagon Allows the Coal Chute to be Adjusted to Any Height, and to a Number of Angles

Changing the corner brace of the wagon box to meet the requirements may not be possible; a new brace is more practical. It should be made of heavy iron, the dimensions depending on the wagon and the chute. Two lugs, or ears, on the brace support a heavy iron rod which turns, hinge-fashion, on the lugs. A collar on the rod is provided with a setscrew so that the height of the chute with reference to the wagon box may be regulated. Heavy hooks on the chute fit over the rod, making a steady, firm support. If both back-corner braces are changed in this manner such a variety of positions is possible that the chute nearly always can be used successfully.—M. E. Duggan, Kenosha, Wis.

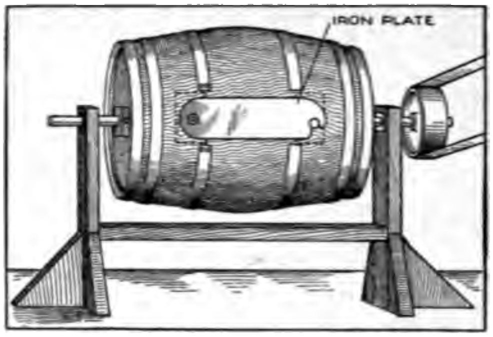
Stop on Faucet Avoids Oil Leakage

Quite frequently the faucet on an oil-supply can, such as is used around a machine shop for storing lard and machine oil, is not provided with a stop, with the result that in closing the cock it is pushed too far, and leakage and waste of oil result. A simple and easily applied stop, which is a successful cure for this difficulty, consists of a strip of metal, bent to the shape shown, and soldered in place so that the end of the handle strikes it, and is thus prevented from moving beyond the closed position.



A Barrel Tumbler for Punch Shop or Foundry

The usual method of removing burs from punched parts or sharp edges, and molding sand from fresh castings, is to tumble them about in a rotating container. Broken pieces of carborundum wheels, emery sand, or some other abrasive, are usually placed in the container to hasten the burring process. The small foundry or punch shop cannot well afford to be without such a tumbler, particularly when one may be easily constructed from a stout barrel. If the parts to be tumbled are light in weight, a drive shaft, 1 in. in diameter, may be used. This rod should be long enough to pass through the barrel and allow about 1 ft. to project from each head, as shown in the sketch. A heavy block of hard wood strengthens the heads where the shaft passes through. A steel pin is driven through the wooden block, and into a hole drilled in the rod, so that the barrel will turn with the shaft. Suitable standards with bearings are provided to support the tumbler, and a pulley is placed on the shaft so the device may be driven from some outside source. Bearings may be made by wrapping the shaft with paper, and casting babbitt around it.



A Tumbler Made from an Ordinary Barrel will Do Good Work in the Small Shop

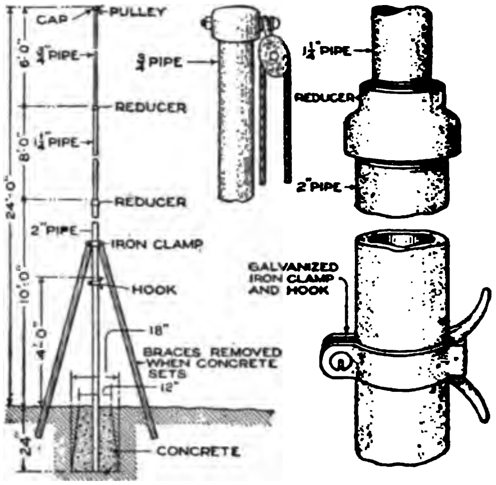
A hole should be cut in the side of the barrel, approximately 2 ft. long and 1 ft. wide. It will be necessary to sever the steel hoops at the point where the hole is cut, but before doing so, nail or screw the hoops to the barrel, near the cut-off point. Thus these hoops will remain to help strengthen the barrel. The cover placed over the hole is made of sheet steel, and arranged so it can be quickly placed in position or removed at will. A good method is to let one end swing on a heavy bolt, while the other end is shaped so it will hook over another bolt, which, when tightened, will hold the cover rigid.—Kenneth Coggeshall, Webster Groves, Mo.

Asbestos Hood for a Soldering Iron

An ordinary soldering iron may be carried some distance from the source of heat, and be kept at working temperature for 15 or 20 minutes, if the point is covered with a thick asbestos hood, made from several layers of sheet asbestos.—K. M. Anderson, Temple, Texas.

A Substantial Flagpole

A neat, substantial flagstaff is made of 12 ft. of 2-in. galvanized-iron pipe, a 2-in. to 1¼-in. reducer, 8 ft. of 1¼-in. pipe, a 1¼-in. to ¾-in. reducer, 6 ft. of ¾-in. pipe, and a ¾-in. cap, put together in the order named. Through the center of the cap a ¼-in. hole is drilled for the bolt which holds the small galvanized pulley to the top of the pole. A galvanized hook for the rope is clamped to the pole, 6 ft. from the lower end, with a strap of galvanized iron. A ⅜-in. rope of the best quality should be threaded through the pulley. The staff is set upon a rock in the bottom of a hole, 2½ ft. deep and 2 ft. in diameter, and is braced temporarily. Around it is poured a rather wet mixture of 1 part cement, 2 parts clean river sand, and 3 parts crushed rock. This should be rounded up above the surface of the ground. When the base has set firmly, the braces may be removed.



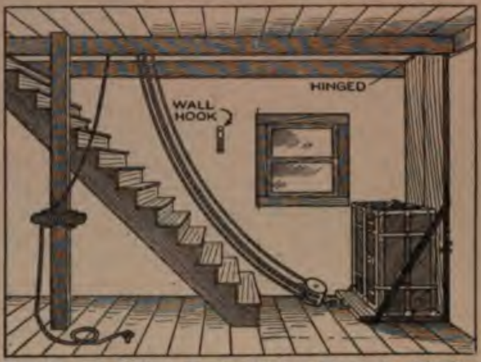
A Flagpole Made of Iron Pipe and Fittings, and Set in Concrete, Is Durable in Construction and Graceful in Appearance

A Swinging Elevator for Trunks and Light Freight

A peculiar form of hand-power elevator, consisting of a hinged platform used in connection with a rope and tackle, will be found useful in homes where trunks are stored in the attic, and in many small shops where freight has to be moved by hand from one story to another.

The elevator is best built in connection with a stairway, although this is not a necessary feature. The platform proper is made of 2-in. material, or lengths of 1-in. lumber very strongly braced. At one end, it is attached with good strong hinges, as shown, while at the other end an end board is placed, large enough so that, when it is swung down into the lower position, a trunk or box may be raised onto it and will rest there securely. If this end board is braced on both sides, as shown, it will be necessary to detach the pulley block when loading on the freight. This is the preferable method, as it is very little trouble to detach the block, and the braces on both sides add much to the strength of the elevator. It may be desirable to leave off one of the braces, since the freight can then be loaded from the side without detaching the pulley block. The upper pulley may be fastened to the ceiling joists, or rafters, of the floor above. If sufficient power is not obtained by pulling the rope with the hands, it is, of course, possible to provide a windlass, or other means of increasing the pull, but this will not be necessary for trunks and like objects.

If the elevator is only to be used occasionally, it is entirely possible to leave it in the upper position so that its floor forms a part of the second-story floor. The rope end can also be carried up the stairway and fastened on a hook above, so that no part of the elevator is in evidence on the lower floor. For places where the elevator would be in more frequent use, it would be well to provide a hook, such as the one shown, on the wall, where the end-pulley block can be hung, out of the way but easily attached to the elevator in a few seconds.

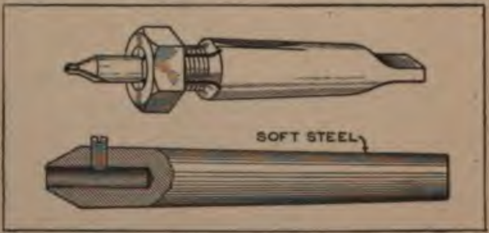


Trunks are Lifted to the Upper Floor by Placing Them on the Swinging Platform and Pulling on the Rope

This type of elevator is not adapted for freight which must be kept standing upright, but this will not be found to interfere seriously with its usefulness.—C. H. Patterson, Portland, Ore.

Countersinking Center Drills Held in Special Chucks

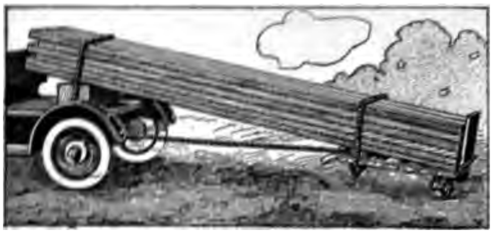
Combination countersink and center drills are in general use in machine shops, but many shops have inadequate means of holding them. The sketch shows two forms of chuck which are readily made for this purpose. The lower one is turned from a bar of machine steel, and has merely a hole in the end, with a setscrew for holding the drill. The taper of the chuck is made to fit the tailstock of the lathe. The upper sketch shows a chuck made from a worn-out ¾-in. twist drill. The end is turned down and threaded with a taper thread. A ¼-in. pipe thread was used on this chuck, and a nut was then tapped out with a standard ¼-in. pipe tap. Slots were sawed in the threaded portion, making spring jaws, a hole being drilled in the end, of the right size for the center drills used. The piece of twist drill should be retempered after it is cut to this shape, and the nut should be casehardened, or, if convenient, a nut may be made from carbon steel and tempered.—M. L. Lowrey, Livermore, Calif.



Two Handy Forms of Chuck, Readily Made, to Take the Combination Countersink and Center Drills Which have Proved So Popular

Load of Lumber Hauled by Light Car and Hand Truck

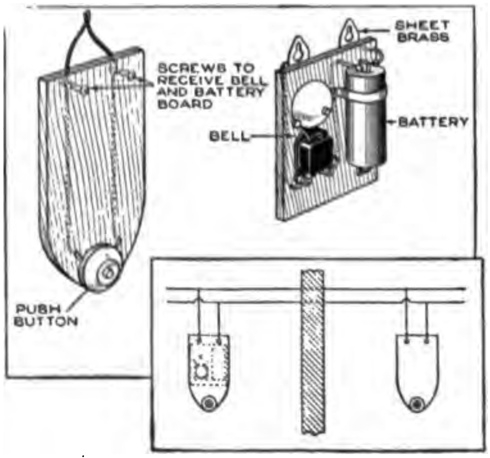
A load of 20-ft. lumber was to be removed, and no wagon or truck of the necessary length was available. The illustration shows how the job was done with a light automobile and a hand truck borrowed from a grocery. The rope from the rear axle of the car to the hand truck pulled the load, while the rope around the rear end of the lumber held the truck off the ground.—Edwin L. Camp, Huntington Park, Calif.



How a Light Automobile and a Hand Truck were Made to Do the Work of a Long Wagon in Hauling a Load of Lumber

Emergency Call-Bell System Has Permanent Wiring

When a person is taken sick in one room of a house, and must have means of calling for assistance from a person in another room, an electric-bell signaling system always is desirable. In time of sickness, however, there is likely to be small opportunity to rig up such a system, and its absence may cause real distress.



A Call-Bell System Which Meets Emergencies without Delay: Each Room Has a Push Button Permanently Installed, and the Bell can be Carried to Any Room Desired and at Once Placed in Service

An effective way to be prepared for this condition, at no great expense, is to install in each bedroom, within easy access of the bed, a push button, mounted on a block, as shown in the sketch. These buttons are connected, in parallel, to a pair of wires which connect all the different rooms. At the top of the block are two screws, each of which is connected to one side of the wiring system. One or more bell boards, such as shown in the upper right-hand corner, are then made, so that they can be hung on the two screws in any room where the bell may be desired. The bell is mounted in series with one or two dry cells on this board, and the wires run underneath the board to the two sheet-brass lugs, which serve the double purpose of supporting the board on the screws and of conducting current into the wires. The weight of the bell board will be sufficient to give a firm contact, if the two lugs are set a good distance apart, and the weight on the board is fairly well balanced.

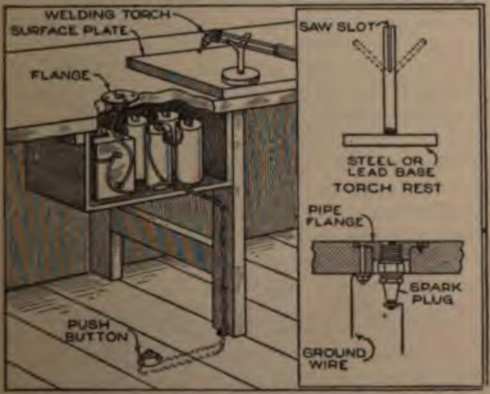
Should sickness occur in any room, it is then only necessary to see that the patient is within reach of the push button, and to hang the bell board in whatever room the nurse or attendant will be. Two or more boards can be used, the same push button then sounding the bells wherever they are placed. If the attendant's work calls her to another room, she can lift the bell board from the screws, take it with her to the other room, and hang it above the push button there. In rooms where use may at some time be found for one of the bells, but which are never used as bedrooms, it is not necessary to install buttons, but merely the two screws the proper distance apart, connected to the two wires which run from room to room.

In an ordinary call-bell system, the addition of extra bells to be sounded simultaneously means extra strain on the batteries, which they may not be able to stand. With this system of wiring, each bell has its own battery, so that any number of them can be hung up in different places and operated by any one of the push buttons without any extra load on the batteries. The bell board may be rigged as shown, or, if a louder alarm is wanted, two cells may be used, one on each side of the bell, in order to balance the weight properly. In times when there is no sickness, the call system may be put to various other uses, and in any case, at least one bell board should at all times be kept on hand, with a battery mounted on it, which is in serviceable condition.—H. E. Gifford, Medford, Mass.

Lighter for the Gas Torch Made from a Spark Plug

It is the practice in some shops to leave a welding torch burning with a small flame when it is not in use, owing to the time required for lighting it. Aside from the danger of fire caused by this custom, it always wastes more or less gas, which is not necessary if some apparatus such as that shown in the sketch is provided. Underneath the bench, in a box mounted for the purpose, are placed four or five dry cells, connected in the usual way to a jump-spark coil, such as used on automobiles or stationary gas engines. The high-tension terminals of the spark coil are connected to a spark plug, mounted as shown in the detail, so that the points are flush with the bench. In the primary circuit is connected a push button, which may be located on the floor, preferably sunk into it, so as to project no farther than the necessary distance for pushing the button with the foot. The torch is lighted by turning on the gas and bringing the nozzle near the spark plug, at the same time pressing the button with the foot. The time required for this operation is practically none, after the workman has become familiar with the location of the button and spark plug. In the upper right-hand corner of the sketch is shown a simple method of making a stand or rack for the torch, which will be handy in connection with the lighting apparatus.

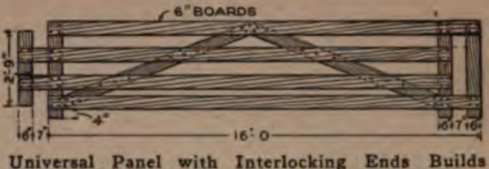
While the gas saved is perhaps a small item, the element of safety is more important, and since the amount of current used is very small, the apparatus will be advantageous in many shops where the all-around usefulness of a welding torch is appreciated.—C. C. Spreen, Detroit, Michigan.



A Spark Plug, Sunk in the Bench, and Connected to a Coil and Battery of Dry Cells, Eliminates the Necessity of Leaving the Torch Burning

Portable Fence Formed of Easily Detached Sections

Modern methods of raising live stock on the cafeteria plan require the use of a succession of pasture crops, planted in rotation to mature at just the time when they give the greatest food value, and in the amounts best calculated to furnish the necessary feed without waste. To use the plan with the greatest success it is necessary to confine the stock to the feeding ground ready at the time, so that they will not injure or waste the growing crops. Since it is not practical to cut a farm permanently into small fields, some system of portable fences must be used.



Universal Panel with Interlocking Ends Builds Portable Fence to Confine Stock to Small Feed Areas

Such a fence is set up very quickly by using a universal panel which may be put together in either of two ways, and which may be made of any size desired. The panels are built of boards, 6 in. wide and 1 in. thick. At one end of each panel a space is left into which an interlocking end of a similar panel will fit. The panels are made rigid with an inverted-V brace. The fence may be set up with the interlocking members forming a sort of zigzag, in which case the fence needs no other support; or, if so desired, the panels may be placed in a straight line, when it will be necessary to drive stakes on each side of the interlocking joints.—Herbert A. Shearer, Chicago, Ill.

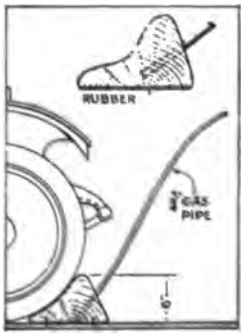
Rubber Cement for Repairing Tire Valve

A bicycle rider found himself 15 miles from the nearest village, with a fast-leaking tire valve, due to the rubber washer being worn out. Remembering that he had some rubber cement in a tube, he applied a small quantity of it to the worn washer, and after letting it dry, inserted it again in the valve stem. It served the purpose perfectly until a new valve stem could be obtained.—Raymond Lister, Winnipeg, Manitoba, Can.

Headrest for Auto Mechanic Strapped to His Head

An automobile mechanic who had experimented with various devices to rest his head upon, while working underneath a car, found that they were all liable to the objection that, when moving around, it was difficult to move them and get them in the right place without losing considerable time. He then made a pad consisting of a block of wood lined with felt, to fit the back of his head, and provided it with a piece of tape which was tied around his forehead. He could thus move around under the car without worry as to whether his head would come down in a puddle of grease on the floor. Should the headrest come in contact with such a puddle, no other precaution is necessary than to slip it off the head before standing erect.—Glenn Bron, Salt Lake City, Utah.

The Auto Stop Block Reduced to Efficiency



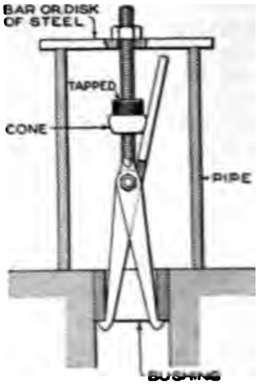
To keep cars in place on the floor of the garage, the usual method is to set a block of wood against the tire, kicking it into place with the foot, which is a very easy and effective process. The trouble comes in removing the block, if it is tightly wedged in. To overcome this difficulty, a large eastern garage uses specially shaped blocks, fitted with pieces of gas pipe for handles. The blocks can thus be removed in less time, and quite easily.—P. P. Avery, Garfield, N. J.

CRepair gums and tire fabrics received in cold weather sometimes appear lifeless when they are merely frozen. Thaw out the material in a warm room before using it.

Spring-Opening Lock Fitted on Ruling Pen

A small, stiff piece of spring steel, drilled to fit under the thumbscrew on an ordinary ruling pen, converts it into a spring-lock instrument. A curve on one end holds the blades together when the metal is turned the long way of the blade, while the other end is made long, to serve as a lever for unlocking. This is done by swinging the lever to one side, thus releasing the spring of the pen, and allowing the blades to open for inking; swinging it back brings the blades together again. Pens thus equipped give service equal to that of high-priced instruments. —Elmer O. Tetzlaff, Cicero, Ill.

An Adjustable Bushing Puller



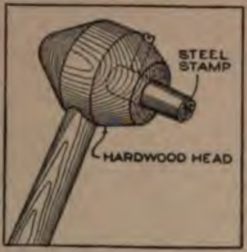
Removing tight bushings is a subject which has engaged the ingenuity of many a mechanic. The device here illustrated may often enable one to extract, without damage, a bushing which would otherwise have to be cut in two in order to remove it. The materials necessary are a short piece of pipe, a steel bar, or disk, across the top, two pieces of steel rod, and two nuts. Both pieces of rod should be forged at the lower end to the shape shown; at the upper end one piece is threaded and the other is left smooth. They are riveted or bolted together, somewhat like a pair of heavy inside calipers. The piece of pipe should be cut out at one side to give access to the cone nut with the fingers. After it is tightened, the bushing is pulled up by turning the upper nut with a wrench.

Draftsman's Triangle with Raised Points or Feet

A draftsman's triangle, of wood or composition material, may be fitted with three brass plugs, or rivets, located near the three corners of the triangle, riveted over to form similar heads on both sides. These will give two advantages in use. The tendency of the ruling pen to blur the line when the ink comes in contact with the triangle will be eliminated, and the triangle will be much easier to lift from the table, as there will be sufficient space under it to insert the finger nail. Triangles fitted up in this way will save much time for the draftsman and tracer.—G. A. Luers, Washington, D. C.

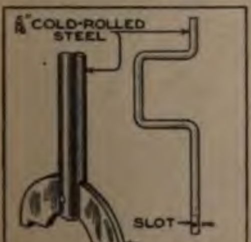
Inspector's Stamp Built into Hammer

Stamping of wood, or soft-metal, parts, such as might be required after inspection, is most quickly accomplished by constructing a stamping hammer, as shown in the sketch. A wooden head and handle are formed out of pieces of fairly hard, heavy wood, and a socket is cut in the head so that the metal stamp can be driven in securely. To stamp an article, simply strike a blow with the tool, instead of using the stamp with a hammer. Such a device is of use in stamping either inspection marks, figures, or letters required in processes of manufacture.



Valve Grinder Made from Washer

A valve-grinding tool such as this will be found very handy for valves which are provided with two holes for gripping them while grinding, rather than with a slot. The shank may be held in a bit brace, or it may be made longer and bent to the shape indicated, so as to be used like a bit brace itself. A heavy iron washer of the proper size is cut in half and filed so as to leave the two lugs projecting the proper distance apart to fit the holes in the valve. The shank is then pinned to the center of this semicircular piece, and the tool is ready for use. It will be seen that the tool has the advantage of equalizing the pressure on all sides of the valve, which greatly assists the formation of a good fit all around the valve seat.—J. E. Barkley, Detroit, Mich.

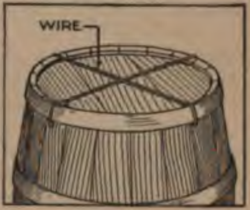


Footstool Made from Harness Hooks

A novel and pretty footstool may be made from a board, about 12 in. square; four harness hooks, 6 in. long or over, and a piece of brocaded velvet, or leather, for covering. Saw off the corners of the board, being sure to get the sides of equal length, thus making an octagon. Screw the four harness hooks under the stool where the corners were cut off. Pad the top of the stool, and cover it with the brocaded velvet or leather. Turn the edges of the covering material under at the lower edge, and fasten with tacks, completing the stool.—Mrs. Grace E. Willey, Concord, N. H.

Wires across Barrel Heads Give Protection

A concern which every year ships many tons of iron castings in barrels had trouble from the heads of the barrels being knocked out. It was found to help a great deal in preventing this to fix across the end of the edge of the barrel heads stout steel wires, twisted together, as shown in the sketch. Four holes were drilled under the first hoop; the wire was passed from one hole to the opposite one, doubled back, firmly twisted, and spliced. The crossing wire was put in in the same way. The barrels held together during long trips and much rough handling.—Irl R. Hicks, Centralia, Mo.

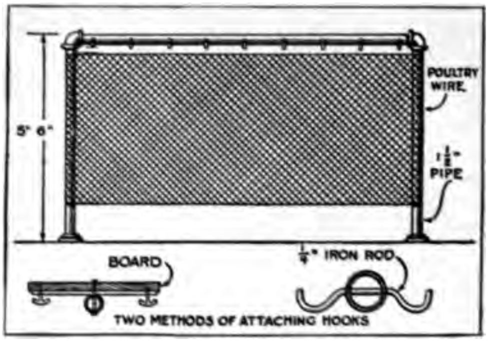


Reaming Large Holes with an Ordinary Twist Drill

Large holes that must be still further enlarged can easily be reamed with a twist drill, when the desired size of reamer cannot be had. By procuring round oak plugs, turned to a driving fit, and driving these plugs into the hole to be reamed, the drill will be less likely to bind and wobble, and therefore less liable to breakage than when trying to drill the holes without the plugs.

An All-Metal Coat Rack

A clothes rack for the shop, which is very strong and durable and free from dirt-catching corners, is made as shown



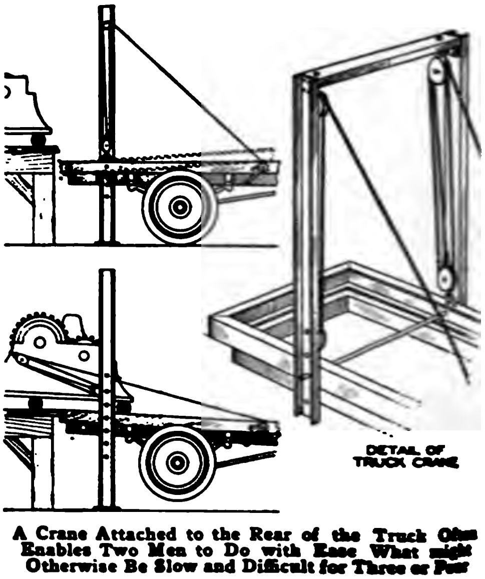
A Stout Sanitary Coat Rack is Readily Made in a Few Minutes from Three Pieces of Pipe, Some Wire Netting, and Scraps of Iron Rod

in the sketch. On a frame, consisting of three pieces of 1½-in. pipe screwed into flanges on the floor, is hung a length of poultry-wire netting to separate the garments hung on one side of the rack from those hung on the other. To the horizontal pipe are attached the hooks, which may be arranged in any of several different ways. The arrangement in the lower right-hand corner is simple, the hook consisting merely of a piece of ¼-in. iron rod, driven through a hole drilled in the pipe, and bent into shape with a hammer and round anvil. The hook arrangement in the left-hand corner gives greater capacity to the rack, but is slightly more expensive. With either of these types of hooks, it is advisable to put a pin through the elbow at one end of the horizontal pipe, so as to keep it from turning, in case one side should be overloaded with heavy clothes.

Crane at Rear of Truck Helps Load and Unload

For a truck man, or anyone engaged in general hauling, the idea of a crane built onto the back end of a truck presents great possibilities in the way of cutting down the time and number of men required for heavy jobs of loading and unloading. The frame of the crane may consist of two pieces of channel steel, long enough to reach from the ground up over the top of any load which may be expected to be carried on the truck; a shorter channel across the top of the two uprights, and a piece of flat sheet steel for the bottom. The first use of the crane, shown in the upper left-hand corner of the sketch, is to raise the rear end of the truck from the ground up to the height of the loading platform, whenever this is necessary. For this purpose, the pulley blocks, two at each side, are arranged as shown, and turning the crank at the right raises the truck to any height desired. Before this is attempted, the front wheels must be securely blocked, front and rear, since, with the rear wheels off the ground, the brakes on an ordinary truck are of no use.

After the truck is in position, it may be held there either by the rope, and the pawl acting against the ratchet, or by putting a pin across through the crane and the frame members. If it is held in the latter way, the upper pulley blocks can then be detached from the top of the crane, and the same tackle can be used to pull the load on or off of the truck, as shown in the lower sketch. Finally, after the job of loading or unloading is done, the upper pulley block may be shifted down to a hook on the bottom plate of the crane, and it can then be raised by turning the crank high enough so that the pin can be placed through the frame members, thus attaching the crane firmly to the truck for carrying. It is then swung down to the position shown dotted in the upper sketch, where it rests

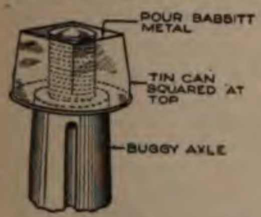


A Crane Attached to the Rear of the Truck Often Enables Two Men to Do with Ease What might Otherwise Be Slow and Difficult for Three or Four

securely during the haul, or until it is next required. At the right, the crane is shown in greater detail, and suggested means of attachment are indicated; these will, of course, vary for different types of trucks. If the U-bolt illustrated is used for attaching the lower pulley blocks to the crane, it will be advisable to attach a similar U-bolt to the middle of the bottom plate of the crane, in order that the frame members may not interfere with the pulley blocks when the tackle is arranged for raising the crane to the carrying position. Dimensions and strengths of the various parts will have to be worked out for each case separately, as they depend on the size, weight, and character of the truck, and the nature of the loads expected.—F. F. Burnstead, Long Beach, Calif.

Emergency Nut Cast of Babbitt

When a nut, especially a large one of a certain size, must be had for repair work, and is not to be found, a good way is to make one from babbitt. In the case illustrated, a portion of a tin can was bent up to a shape approximating that of the nut desired. A hole was made to fit the thread of the axle, and the can was set in place to form a mold. After greasing the threads and the mold with an oily rag, babbitt metal was poured into the mold. When cool, the tin is torn away and a nut remains, which, if it has not the strength of a steel nut, will often give good service. The process is especially useful when a nut with a left-hand thread is required, as left-hand taps of the required size are less likely to be found handy than right-hand taps, while the babbitt nut can be used in either case.—W. J. Mahnke, Coeur d'Alene, Idaho.



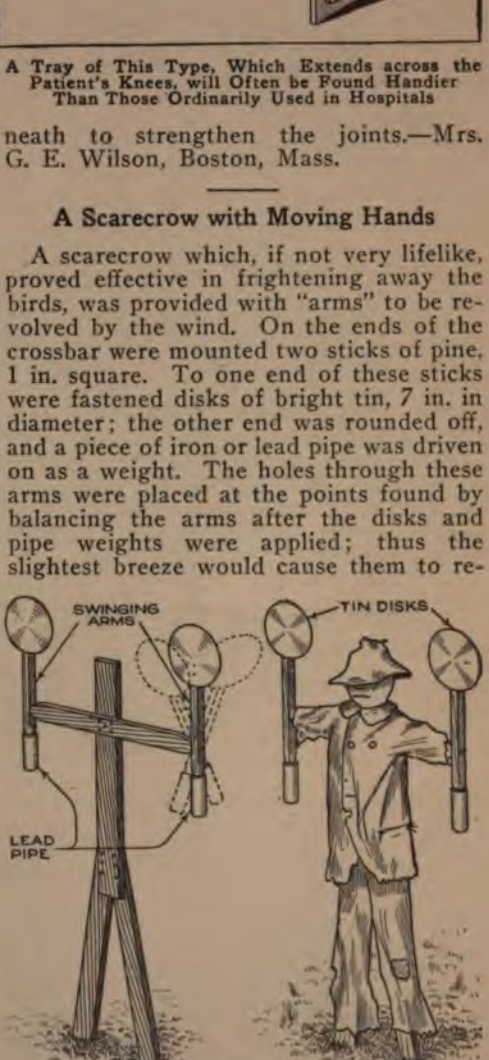
Invalid's Table Rests on Bed

For the invalid who is able to sit up in bed, a great convenience is a table, or tray, made somewhat shorter than the width of the bed, with supports, 8 or 10 in. high, at either end, so that it can be set upon the bed directly over and in front of the patient. Three sides of the top are furnished with a narrow molding, and small brass handles attached at the ends. The wood may be stained and ornamental pockets made on its ends. These end pieces can be fastened to the top with nails or screws directly, and some form of blocks or braces should be used underneath to strengthen the joints.—Mrs. G. E. Wilson, Boston, Mass.

A Tray of This Type, Which Extends across the Patient's Knees, will Often be Found Handier Than Those Ordinarily Used in Hospitals

A Scarecrow with Moving Hands

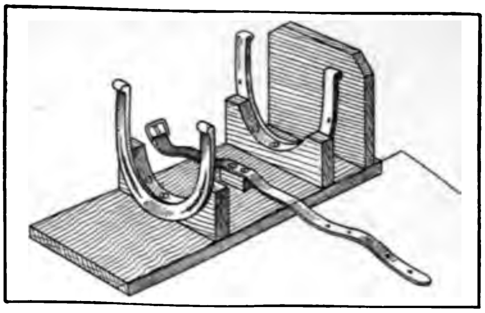
A scarecrow which, if not very lifelike, proved effective in frightening away the birds, was provided with "arms" to be revolved by the wind. On the ends of the crossbar were mounted two sticks of pine, 1 in. square. To one end of these sticks were fastened disks of bright tin, 7 in. in diameter; the other end was rounded off, and a piece of iron or lead pipe was driven on as a weight. The holes through these arms were placed at the points found by balancing the arms after the disks and pipe weights were applied; thus the slightest breeze would cause them to revolve. They will move somewhat more freely if washers are placed between them and the crossbar.—Sylvanus Van Aken, Port Ewen, N. Y.



The Scarecrow Waves Its Arms with Great Rapidity Whenever a Slight Wind Blows, and Is Very Efficient in Keeping Away the Predatory Birds

An Asparagus Buncher

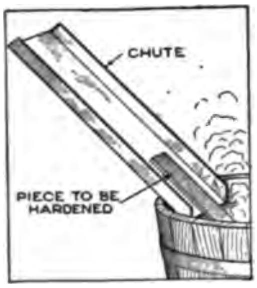
A handy rack for bunching and tying up asparagus, rhubarb, and similar garden produce, is made from two horseshoes, mounted on blocks of wood. The base should be about 8 in. wide and 13 in. long. A block, about as high as the horseshoe, should be used as a headboard. The horseshoes are nailed to two blocks, sawed out as shown, and a leather strap, tacked to the baseboard, will serve to hold the bunch while it is being tied. The ends of the horseshoes should be set out somewhat with a hammer before mounting, so as not to bend inward at the top. String cut to the right length is placed on the board before starting work.



Vegetables, Such as Asparagus, are Laid in This Rack, Made from Horseshoes, and are Held with a Leather Strap While being Tied for Market

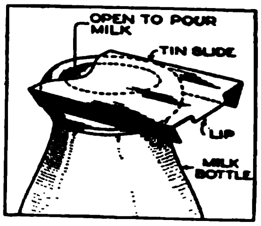
Hardening Long, Thin Pieces without Warping

It is difficult to harden a long, thin piece of steel without considerable warping. This is due to the cooling of different parts at different times, producing internal strains. If the red-hot piece is allowed to slide into the liquid on a chute held at an angle of about 45°, it will strike the water, end foremost, and cut into it at once. This gives better results than dropping it directly from the tongs, as the latter allows it to tilt, which will keep it from cutting in sharply and delay the contact of the liquid with some parts of the surface, thus causing warping. The chute may be a piece of scrap iron or tin, about 2 ft. long, bent up on *two sides as shown.*



A Milk-Bottle Cover

The thin tin boxes in which some kinds of fancy crackers are packed may be easily cut by scissors to make an excellent milk-bottle cover. Cut a strip a little wider than the top of the bottle, so that both sides may be bent down to engage the neck of the bottle, the tin being bent inward on an angle a little less than that of the wall of the lip. In cutting the ends of the tin, leave a lip or point on one end, to be bent down, and make an inward curve on the other end, to permit an opening to be made without removing the cover from the bottle.

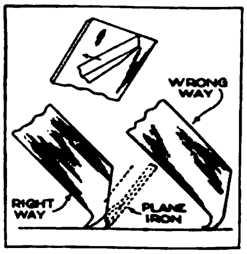


Magnetic Locator Useful in Wiring Finished Houses

A simple method of locating positions for openings in wiring old houses is that of using an ordinary magnetic compass, and a large, magnetized file. The file, which should be strongly magnetized, is driven into the ceiling at the point where it is desired to bore the hole. By moving the magnetic needle over the flooring above, it is possible to locate the desired position by the agitation of the compass needle.—Peter J. M. Clute, Schenectady, New York.

Good and Bad Scraper Edges

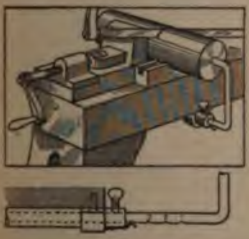
A great many carpenters have constant trouble in putting a good working edge on a scraper. This difficulty is almost always due to the curling of the honed edge while "turning" it, or, to use an inappropriate though widely employed term, "rolling" it. While it is quite difficult to learn to turn the edge of a scraper, anyone can easily rectify a poorly turned edge by straightening out the portion that has curled.



This is easily accomplished by running the sharp edge of a chisel along the inside of the turned edge of the scraper. To do this, the chisel must be held at a very acute angle to the surface of the scraper blade, and at an angle of about 45° to the turned edge, holding the under, or flat, side of the chisel up and going along the edge lightly and without the use of any force. The sharp, honed, and perfectly straight edge of the chisel takes hold of the finest curled scraper edge. The angle used in the operation is very similar to that at which a plane iron is honed and set in the plane. The same scraper edge can be brought back to good working condition repeatedly by employing this process, which not only rectifies the edge, but also removes from it particles of wood, dust, and glue.—Henry Simon, Laguna Beach, Calif.

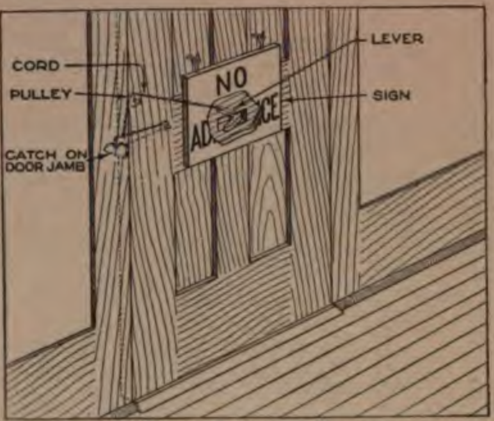
Measuring Gauge for Power Hacksaw

The ordinary forms of power hacksaw are not provided with gauges for determining the length of the pieces to be sawed, and the usual method is to measure the length required with a scale, and set the piece in the vise so that the saw comes at the proper point. In order that the hacksaw may be provided with its own measuring scale, a gauge like the one illustrated can be readily built onto almost any power hacksaw. A piece of thick tubing is held in metal strips, screwed under the frame of the machine, and a setscrew, of a form easily turned with the fingers, is threaded into this tube. For strength and durability, it is well to reinforce the tube at the point where the setscrew comes by driving on it, or soldering around it, a piece of larger tubing, or an iron strap, so that the screw will have a longer thread to work against. Inside of this tube slides a piece of round iron rod, which is bent to a U-shape, as shown. Upon it may be marked graduations to indicate directly the length of the pieces to be sawed off from the stock. It will also be found useful in many shops to add a spring and some notches in the rod, at a distance from each other of 1 or ½ in., so that the gauge may be easily set to these frequently used points.—C. Anderson, Worcester, Mass.



Door Latch Operated by Sign Reading "No Admittance"

A factory made use of a novel device on one of its doors, which was intended for the use of employes only, although opening on a semipublic thoroughfare. There was on the outside of the door no knob or latch, and no other visible indication of how to open the door. The latch behind the door was, in fact, worked by a lever and cord, which was operated by pressure at the proper spot on the "No Admittance" sign. This was known to employes, and the secret can readily be discovered by anyone after gaining access, but the method by which the employes opened the door was far from being apparent to bystanders, and did good service in keeping out intruders.—H. F. Blanchard, Portland, Me.



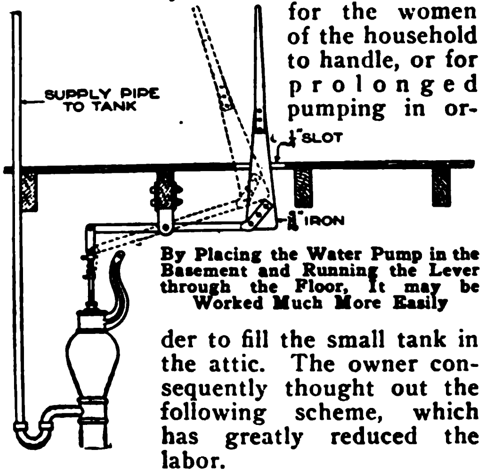
The Door is Provided with a Latch Opened by Pressure on the "No Admittance" Sign, and the Stranger, Seeing No Means of Entrance, Is Forced to Obey the Sign

Making a Screwdriver Magnetic

Magnetized screwdrivers are useful for many classes of work, the carbon steel of which screwdrivers are made being capable of retaining considerable magnetism. A screwdriver which will retain a considerably stronger magnetism than an ordinary one, may be made from a round piece of tool steel, or preferably of tungsten steel, by simply grinding the end of a bar into the form of a very short screwdriver blade.—Maurice Clement, Youngstown, Ohio.

Long Lever Eases Action of Force Pump

A vertical force pump of the common kitchen variety was too hard-working for the women of the household to handle, or for prolonged pumping in order to fill the small tank in the attic. The owner consequently thought out the following scheme, which has greatly reduced the labor.



By Placing the Water Pump in the Basement and Running the Lever through the Floor, It may be Worked Much More Easily

The pump was placed under the kitchen floor, as shown, and the blacksmith made a lever from an old axle, somewhat of the shape illustrated. At the left end was placed a link, as in common pump jacks, and to it was fastened the upper end of the pump rod. The other end of the lever was riveted to a piece of sheet iron, and the handle was fastened to it. The lever was pivoted to the underside of a joist by means of an eyeplate and bolt. A slot in the floor allowed the handle to be swung back and forth. This slot was too narrow to permit mice to pass through, or much cold air to enter. Where 50 strokes of the pump was formerly quite tiresome, the operator can now take 500 without undue exertion.

Handy Kitchen Chopping Board

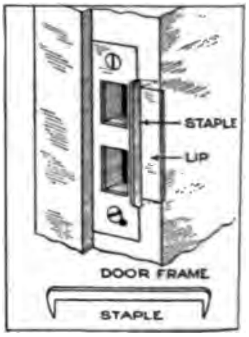
A handy chopping board may be quickly and easily made from a piece of hard wood, a pointed kitchen knife, and a large staple. The staple is driven into the edge of the chopping board far enough to set it firmly and at the same time to allow the point of the knife to fit into it. To operate, the knife is raised and lowered with one hand, while *the food is* passed under the blade with the other. Use of this device makes it easy to chop, slice, or mince, and there is little danger of the knife slipping, even though great pressure is applied.

Nail Makes Satisfactory Plow-Plane Bit

When cutters of a special size are required for plow planes, a quick and efficient way to make them is to dress down a large nail or spike to the required shape. Although the adjustment of such a cutter will present somewhat greater difficulty than one of the ordinary type, its performance, if it is carefully made and sharpened, will be quite satisfactory for many purposes. Cutters up to ¼ in. wide can be made from 16, 20, and 30-penny spikes.

Staple Prevents Manipulation of Lock

Many doors which have been long in use have shrunk to such an extent that there is quite a space between the door and frame when the door is closed. Manipulation of the locks through this space is quite possible, especially where spring locks are used. An effective method of preventing this is to make a staple of sheet iron, long enough to take, between the two pointed ends, the lip of the striking plate. If this staple is then firmly driven in the position shown, it will be impossible to get at the lock to manipulate it.



Carrying Piano Made Easy by Handles

When a heavy piano is carried upstairs and down and from one place to another, injuries to the instrument and to steps and doorways will usually result. The difficult thing in the transportation of a piano is not in the weight but in the placement of the weight. A carrier which will reduce this difficulty is made easily from two 10-ft. pieces of 2 by 4-in. lumber. These are placed, one at the front of the piano, between the legs, and

INDEX TO VOLUME XVI

SHOP NOTES FOR 1920

Accurate Method of Setting Thread Tool in Lathe 3095
Acetylene Manifold Heater Starts Cold Auto Engines 3225
Acid, Old Files Made Serviceable by Treating with 3157
Acid-Proof Cement for Pipe Fittings... 3159
Action of Force Pump, Long Lever Eases 3302
Adjustable Bushing Puller.............. 3296
Adjustable Chute for Coal Wagon..... 3291
Adjustable Leg for Table or Bench...... 3096
Adjustment of Light, Fine, Divided Window Shades Permit.................... 3261
Air-Bellows Device Protects Sand-Blast Operators 3137
Air Brush, Sprayer or, Easily Made from Common Materials 3208
Air Compressor, Garage, Made from Discarded Cycle Motor.................. 3166
Air-Cooled Motor, Water-Jacketing An. 3189
Air Hammers, Storing in Oil Improves Working Quality 3212
Air Hose, Weight and Pulleys Keep Convenient and Reduce Wear........... 3266
Air Intake, Auto, Guarded for Crossing Streams 3164
Air Whistle, Loud-Sounding, for Camp or Motorboat 3143
Alarm, Automobile-Thief 3265
Alcohol, Wood, Simple Test to Distinguish from Denatured Alcohol....... 3157
Alining Automobile Wheels, Gauge Stick Useful for 3157
Alining Hold-Down Bolts in Concrete Foundations 3191
Alteration Adapts Twist Drill for Soft Metals 3225
Aluminum Bronze Letters, Size for Holding 3210
Angle Iron, Broken Slate Instrument Panel Repaired with 3146
Angle Pieces Shaped in V-Block with Arbor Press 3205
Angles and Curves for Drafting Jobs, Making Special 3259
Animals, Safety Radial Tether for..... 3233
Animals, To Keep from Molesting the Garbage Can 3233
Ankle Strains in Driving Auto Relieved by Heel Block 3113
Annealed Wire, Method of Making Copper Rivets from 3132
Anthracite, Using Soft-Coal Screenings with 3257
Apparatus for Locating Trouble in Aerial Telephone Cables.............. 3101
Apparatus of Simple Construction for Bending Heavy Pipe 3185
Applications, Adjustable Counterboring Tool Has Many 3168
Arbor Press, Angle Pieces Shaped in V-Block with 3205
Armature of Motor, Pipe Aids in Removing 3124
Articles in Place, Towel-Rack Improvement Keeps 3137
Asbestos Hood for a Soldering Iron..... 3292
Asbestos Plaster, Strong, Formula for Making 3168
Ashes, Save Coal by Burning.......... 3255
Asparagus Buncher 3300
Atomizer Starter, Spark-Plug, for Automobile Engines 3213
Attachment Adapts Tachometer for Shafts without End Centers.......... 3127
Attachment for Use as Square, Handsaw Fitted with 3251
Attachment to Blowtorch, Soldering Iron for 3217
Auto Air Intake Guarded for Crossing Streams 3164
Auto and Wagon Springs, Paraffin Grease for 3217
Auto, Ankle Strains in Driving Relieved by Heel Block 3113
Auto-Body Panels, and in Tanks, Removing Dents in 3140
Auto Chassis, Loading Truck Facilitates Handling of 3263
Auto Creeper, Headrest for, Made from Inner Tube 3246
Auto Drive Shaft, Spring End Bearings Overcome Play in 3134
Auto Engines, Cold, Acetylene Manifold Heater Starts 3225
Auto Engine, Increasing the Power of.. 3216
Auto Engines, Renewing Valve Guides in 3239
Auto Engine, Rubber Tube Protects Ignition Distributor of 3128
Auto Engines, Used Oil from Makes Good Fuel 3279
Auto-Jack Lever, Pedal Extension on, Saves Labor 3214
Automatic Electric Backing-Up Automobile Light 3210
Automatic Shut-Off for Filling Cans or Buckets 3231
Automatic Signaling Device for Projecting Machines 3178
Automatic Weighing Machine Electrically Operated 3125
Auto Mechanic, Headrest for, Strapped to His Head 3296
Automobile Brake, Old, Adapted for Use on Windlass 3192
Automobile Crank-Case Bolts, One-Man Wrench for 3207
Automobile Crank Cases, Testing Oil Level in 3220
Automobile Engines, Spark-Plug Atomizer Starter for 3213
Automobile, Crippled, Moving Single-Handed 3234
Automobile Doors, Rattling of, Overcome by Setting Hinges 3097
Automobile-Exhaust Heater Mounted in Floor Register 3251
Automobile Gasoline Gauges, Calibrating 3212
Automobile, Handy Chemical for Use about 3200
Automobile Hood, Rubber Hose Stops Rattling of 3147
Automobile Light, Automatic Electric Backing-Up 3210
Automobile Motor, Testing Compression in Cylinders of 3110
Automobile, Passenger, Converting into Delivery Car 3237
Automobile Radiator as a Heating Unit 3204
Automobile Steering Wheel, Electric Hand Warmer for 3282
Automobile, Running Board on Strengthened by Brace 3246
Automobile Steering Column, Flash Light on 3229
Automobile-Thief Alarm 3265
Automobile Use, Telephone and, Stethoscope for 3161
Automobile Wheels, Device for Removing from Axle 3158
Automobile Wheels, Gauge Stick Useful for Alining 3157
Automobile Wheel, Effective Emergency Repair for 3182
Automobile Wheels, Removing with the Hub Cap 3244
Automobiles, Exhaust Deflectors Keep Fumes Out of 3223
Auto Motors, Truck with Lifting Platform and Cradle for.................. 3131

[illegible]
[illegible] Bench Grinder or Polishing Head Made from Old Piston 2249
Bench Lathe, Drill-Press Attachment for 2216
Bench, Removable Heavy Edge for..... 2233
Bench Strips or Sheets 2271
Bench Stop Which Clamps the Work.... 2271
Bench Tool, Pedal Control Wire-Stripping 3112
[illegible] Smoke- [illegible] 3154
[illegible] Machines and Similar Machine Parts 3147
[illegible] by [illegible] 3257
[illegible] and a Clamping [illegible] 3145
[illegible] Piston [illegible] 3161
[illegible] and a [illegible] 3159
[illegible] for Attach- [illegible] 3217
[illegible] Table for Work [illegible] 3113
[illegible] Heavy Detachable [illegible] 3100
[illegible] Quick and Convenient 3207
[illegible] Has Window Carriage [illegible] 3122
[illegible] Pencil Trac- [illegible] 3145
[illegible] Engine Ex- [illegible] 3121
[illegible] Mixture for Patching [illegible] 3132
[illegible] Float Mooring [illegible] 3110
[illegible] Paper Tight- [illegible] 3278
[illegible] Easy-Running T- [illegible] 3223
Boiler [illegible] Method of Removing 3199
Boiler Leaks, Durable Solderless Repair for 3306
Boiler, Old, Cupola Made from.......... 3219
Boiler Scale, Boiling Potatoes to Loosen 3277
Boiler Scale, Dissolving, Saves Fuel and Provides More Heat 3282
Boiling Potatoes to Loosen Boiler Scale 3277
Bolt Holes, Locating Where Scriber cannot be Used 3245
Bolts, Automobile Crank-Case, One-Man Wrench for 3207

Bolts, Device for Tightening Quickly with Brace 3129
Bolts, Hold-Down, Alining in Concrete Foundations 3191
Bolts, Serviceable Tool for Cleaning Threads on 3200
Bolts, Small, Locked Quickly by Cutting with Chisel 3104
Boring Bars, Lathe, Methods of Holding Tools in 3200
Boring Large Holes in Glass.......... 3220
Boring Small Machine Parts after Grinding 3170
Boring Tool, Pattern Maker's, for Small, Deep Work 3148
Bosses and Hubs on Drill Press, Tool for Machining 3130
Bow, Snap, Aids in Making Chalk Lines 3207
Box Bottom, Self-Raising, Aids in Obtaining Contents 3234
Boxes as Units, Stock Bins Built Up from 3109
Boxes, Hook Fitted to Hand Truck Holds 3103
Boxes, Winch Truck for Piling and Loading 3111
Brace and Bit, Breastplate for.......... 3257
Brace, Device for Tightening Bolts Quickly with 3129
Brace, Ratchet, Remodeled for Work in Cramped Spaces 3242
Brace, Running Board on Automobile Strengthened by 3246
Brake, Old Automobile, Adapted for Use on Windlass 3192
Branches and Netting, Large Minnow Net Made of 3112
Brass Scraper for Cleaning Tools........ 3212
Brass Washers, Thin, Tool for Cutting.. 3198
Bread Pans, Desk Drawers Made of...... 3261
Breaking Porcelain Tubes Squarely...... 3100
Breast Drill, Vise and, Used as a Substitute Drill Press 3143
Breastplate for Brace and Bit.......... 3257
Brick and Mortar, Holes Drilled through 3179
Broken Point, Setting a Lag Screw in a Hole Containing.......... 3187
Broken Slate Instrument Panel Repaired with Angle Iron.......... 3146
Brushes, Keeping Soft with Paraffin... 3268
Bucket Jack, Convenient Ladder, for Roof Workers 3196
Buggy Axle, Pinch Bar Made from...... 3257
Buggy Hub Used for Repairing Worn Threads of a Pump Cylinder.......... 3180
Building, Labor-Saving Method of Excavating under a 3166
Bulb, Tin Foil Winding on, Intensifies Electric Light 3096
Buncher, Asparagus 3300
Burner, Renewing Enlarged Orifice in.. 3261
Burrs inside Tubing and Castings Removed by File in Chuck.......... 3196
Bushing Fitted Snugly by Knurling or Roughening Surface 3097
Bushing Puller, Adjustable 3296
Buzz Saw, Glass Plate over, Protects Eyes 3281

Cabinet Trim, Making Dentil Moldings for 3098
Cable, Heavy Covered, Pipe Cutter Used to Strip 3134
Calculating Belt Lengths for Splicing.. 3245
Caldron Pours Molten Metal with One Hand 3133
Calibrating Automobile Gasoline Gauges 3212
Calipers for Overhead Work Eliminate Use of Ladder 3174
Call-Bell System, Emergency, Has Permanent Wiring 3294
Camera, Motorcycle Back Rest to Carry 3236
Camp or Motorboat, Loud-Sounding Air Whistle for 3143
Can or Container, Clips for Holding Straining Cloth over 3124
Cans or Buckets, Automatic Shut-Off for Filling 3231
Canvas, Binder, Method of Preventing from Ripping 3171
Caps, Wooden, Convert Machinists' Vise into Bench Clamp 3158
Car Leaving Garage Automatically Gives Warning 3232
Car, Light, and Hand Truck, Load of Lumber Hauled by 3294
Carburetor Troubles, Chamois-Skin Gasoline Filter Avoids 3260
Carpenters' Squares, Hardware Store Has Special Drawer for.......... 3289
Carpet Pad for Wood Planes Saves Frequent Sharpening 3130
Carry Tool Checks on a Safety Pin.... 3267
Carrying Piano Made Easy by Handles.. 3302
Carrying Window Panes, Handy Wire Hook for 3259
Cars Equipped with Split Rims, Serviceable Tire Remover for.......... 3172
Casehardening Jobs, Improvised Furnace for Small 3206
Casehardening, Preventing in Dressing Circular Saws 3138
Caster for Heavy Blueprint Frame, Detachable 3100
Casting, Hard, Novel Method of Machining Slot in 3144
Casting, Tube or, Electroplating the Inside of 3152
Castings, Softening Hard Iron and Brass 3190
Cellar Windows, Timesaving Device to Open and Close 3232
Cement, Acid-Proof, for Pipe Fittings.. 3159
Cement, Holdfast Leather-Belting...... 3176
Cement, Making Drill Jigs of.......... 3237
Cement Mixture for Patching Dents in Boat Hulk 3132
Cement, Repairing a Cracked Water Jacket with 3284
Cement, Repairing a Pillar with........ 3254
Cement, Roofing, Staining Wood a Dark Color with 3270
Cements for Pipe Joints 3127
Center Drills, Countersinking, Held in Special Chucks 3293
Center Punch, Square-Point, Handy for Revising Marks 3108
Center Punches Made from Old Rat-Tail Files 3145
Centrifugal and Screw Type Pumps Work Together 3270
Chain and Padlock, Theft of Shovels Prevented by 3116
Chain-Driven Trucks, Reliable Oiling Systems for 3215
Chair Cane, Method of Planing....... 3157
Chair Shelf That Folds Out of the Way. 3210
Chair, Swivel, Made from Wagon-Wheel Fellies 3256
Chalk Line and Reel, Self-Chalking... 3102
Chalk Lines, Snap Bow Aids in Making. 3207
Chalking a Tap to Get a Perfect Fit... 3180
Chamois-Skin Gasoline Filter Avoids Carburetor Troubles 3260
Check-Out Board Helps Locate Mechanics in Shop 3096
Chemical, Handy, for Use about the Automobile 3200
Chest, Neat, under Lathe Holds Tools and Gears 3273
Chicks, Food for, Poultry Feeder Places Out of Hens' Reach.......... 3250
Children, Push Button Locked against Interference by 3256
Chipping and Breaking, Garden Hose Protects Dishes against.......... 3221
Chisel, Small Bolts Locked Quickly by Cutting with 3104
Chisels, Tin Guards for Edges of..... 3137
Chopping Board, Handy Kitchen...... 3302
Chuck Holds Auto Timers for Refinishing 3262
Chuck, Jaws for Holding Hexagonal Stock in 3109
Chuck, Micrometer Used as Indicator on Work in 3128
Chuck Which Centers and Drives Pistons being Machined in Lathe.......... 3181
Chucks, Special, Countersinking Center Drills Held in 3293
Chute for Coal Wagon, Adjustable..... 3291
Cigar-Case Humidifier, Electric........ 3197
Cigarette Box Deals Out One at a Time 3201
Circuits, Experimental, Timesaving Magazine Fuse Box 3218
Circular Saw, Discarded, Forms Loud Bell for Use in Shop.......... 3250
Circular Saws, Preventing Casehardening in Dressing 3138

Cistern Cap. Reinforced-Concrete...... 3193
Cistern. Old. Remodeled as Storage Space 3123
Cistern Pump. Outside. Operated from the Kitchen 3236
Clamp. Handy. Made from Waste Materials 3171
Clamp Holds Work Down on Top of Bench 3246
Clamp. Three-Way Hand. Has Many Uses 3144
Clamp. Woodworkers'. Compressing Stiff Clutch Springs with.......... 3264
Clamping Beveled-End Work. Half-Round Blocks Aid in.......... 3145
Clamping Block for Filing Scraper Blades 3258
Clamping Device. Adjustable. for the Machine Shop 3158
Clamps the Work. Bench Stop Which.. 3271
Clean. Keep Lamps 3268
Cleaning a Clock Quickly and Thoroughly 3199
Cleaning Files with Block of Wood... 3147
Cleaning Out Clogged Drains with Fluid Pressure 3274
Cleaning Screw-Machine Products, Tank for 3174
Cleaning Small Pinion Gears, Efficient Method of 3167
Cleaning Threads on Bolts, Serviceable Tool for 3200
Cleaning Tools. Brass Scraper for..... 3212
Clips for Holding Straining Cloth over Can or Container.......... 3124
Clock, Cleaning Quickly and Thoroughly 3199
Clogged Spout Readily Cleaned with Hose 3233
Close of Workday, Machines Oiled at, Start Easily in Cold.......... 3134
Close Work, Handle for Bits for...... 3204
Closing Cast-Iron Pipe Ends without a Plug 3260
Clothes, Mechanic's, Laundered by Exhaust Steam 3279
Clutch, Holding a Loose Grease Cup on. 3133
Clutch Springs, Stiff, Compressing with Woodworkers' Clamp 3264
Coal Bin, Outside, Provides Convenient Storage 3229
Coal, Heat and, Partitioning Off a Room to Save 3258
Coal, Keep Wet 3249
Coal Pile, Extinguishing Spontaneous Fire in 3252
Coal, Sand Furnace for House Heating Conserves 3209
Coal, Save by Burning Ashes.......... 3255
Coal, Thermometers Save in Small Plant 3250
Coal Wagon, Adjustable Chute for..... 3291
Coat Rack, An All-Metal.......... 3298
Coin Is Handy Gauge for Spark-Plug Gap 3118
Cold, Machines Oiled at Close of Workday Start Easily in.......... 3134
Cold-Water System with Cooling Coil in Supply Pipe 3180
Collapsible Tubes, Keeping Inverted Prevents Contents Drying Out.......... 3259
Collar for Flue-Cutter Slip-Joint Shaft. 3194
Collars, Old Linen, Make Good Marking Tags 3287
Color, Dark, Staining Wood with Roofing Cement 3270
Colored-Light Electrical Shop-Call System 3197
Comb for Gooseberry Picking Saves Time and Fingers 3225
Combination Stepladder and Portable Elevator 3181
Comfort to Workmen, Fans Belted from Mill Shaft Give 3151
Compass-Point Centers, Fixing on Drawing Sheets 3179
Compression in Cylinders of Automobile Motor, Testing 3110
Compression of Cylinder Which is Not Firing, Relieve 3217
Compressing Spring Wire While Bending Preserves Strength 3260
Compressing Stiff Clutch Springs with Woodworkers' Clamp 3264
Compression of Old Gas Engines, Improving 3211
Concrete, Cracks in, Filling with Putty 3201
Concrete Culverts, Wagon Wheels Provide Forms for 3108
Concrete Flywheels for Light Foot-Power Machinery 3140
Concrete, Forge of, for Single or Multiple Use 3123
Concrete Foundations, Alining Hold-Down Bolts in.......... 3191
Concrete Highways, Wooden Roller Aids Construction of 3159
Concrete Safe, How to Make Fireproof.. 3206
Concrete Sidewalks, Folding Square for Dividing 3197
Concrete, Small Drains in, Made with Pipes 3100
Concrete Tombstone, Homemade....... 3281
Concrete Ventilating System for Stable. 3241
Conduit, Bending Easily at Workbench 3226
Conduit Elbows, Device for Bending... 3177
Cone Container Conserves Powdered Emery 3229
Connecting Sections of Pipe, Easy Method of 3160
Connections, Loose, Electric Ignition System Wired to Counteract.......... 3179
Conical Points for Engine Bolts Simplify Motorcycle Repairs 3139
Conserving Small Pieces of High-Speed Steel, Tool for 3176
Construction of Concrete Highways, Wooden Roller Aids in.......... 3159
Contact Blades, Knife-Switch, Testing. 3142
Control, Extension, for Tractor Aids in Work of Plowing.......... 3175
Converting a Passenger Automobile into Delivery Car 3237
Converting Broken Drills into Lathe Tools 3221
Converting Metric Measures, Quick Methods of 3192
Cooling Coil in Supply Pipe, Cold-Water System with 3180
Cooling Fan, Rim Reinforces.......... 3102
Cooling Large Bearings with Grounded Copper Wires 3127
Copper Rivets, Method of Making from Annealed Wire 3132
Copper Tubes, Small, Cutting with Side-Cutting Pliers 3165
Copper Wires, Grounded, Cooling Large Bearings with 3127
Corn, Seed, Testing for Germination... 3288
Cotter-Pin Extractor Has Hammer Built In 3245
Cotter Pins, Holder and Pick-Up Tool for 3242
Cotton and Muslin, Respirator Made of. 3116
Counterboring Tool, Adjustable, Has Many Applications 3168
Countersinking Center Drills Held in Special Chucks 3293
Counterweight Returns Block and Tackle to Loading Point.......... 3129
Counterweights on Portable Drills and Other Heavy Tools.......... 3228
Coupling, Locomotive-Apron Holder Aids Quick 3141
Coupling, Removing a Broken Nipple from 3212
Cover for Oil Holes in Dirty Places..... 3244
Cover, Milk-Bottle 3300
Cracks in Concrete, Filling with Putty. 3201
Cramped Spaces, Work in, Ratchet Brace Remodeled for.......... 3242
Crane at Rear of Truck Helps Load and Unload 3298
Crane, Shop Truck That may be Picked Up by 3220
Crank-Case Bolts, Automobile, One-Man Wrench for 3267
Crank Cases, Testing Oil Level in Automobile 3229
Crankcase, Improvised Electromagnet Picks Wrench from.......... 3276
Crankshaft with a Cracked Web, Emergency Repair for.......... 3263
Creeper for Use under Vehicles is Provided with Tool Trays.......... 3153
Creeper, Shield on, Protects Face When Working under Auto.......... 3145
Crushed, Railing Protects Young Pigs from being 3240
Culverts, Concrete, Wagon Wheels Provide Forms for.......... 3108

Cupola Made from an Old Boiler........ 3219
Curved Surfaces, Sandpaper Block for Use on 3168
Curves, Irregular, Homemade Gauge for 3122
Cutter, Handy Twine Holder and...... 3284
Cutting Disks or Rings Accurately from Sheet Metal 3162
Cutting Small Copper Tubes with Side-Cutting Pliers 3165
Cutting Thin Brass Washers, Tool for.. 3198
Cutting Washers and Packings, Homemade Machine for 3144
Cutting with Chisel, Small Bolts Locked Quickly by 3104
Cycle Motor, Discarded, Garage Air Compressor Made from 3166
Cylinder, Steam-Engine, Device for Vulcanizing Tires on........ 3171
Cylinder Which is Not Firing, Relieve Compression of 3217
Cylinders, Guide for Inserting Piston Rings in 3133
Cylinders of Automobile Motor, Testing Compression in 3110
Cylinders, Rebored, Old Piston Used to Polish 3233
Cylinders, Scored, Repaired by Soldering 3285

Dairy Barn, War-time Efficiency Methods Applied to........ 3163
Dance Floor, How to Make Wax for... 3202
Dehydrating Denatured Alcohol........ 3181
Delivery Car, Converting a Passenger Automobile into 3237
Denatured Alcohol, Dehydrating........ 3181
Denatured Alcohol, Simple Test to Distinguish Wood Alcohol from........ 3157
Dentil Moldings for Cabinet Trim, Making 3098
Dents in Auto-Body Panels and in Tanks, Removing 3140
Depth Gauge for Hacksaw........ 3119
Depth Gauge for Wooden Miter Boxes.. 3214
Depth Gauge, Simple, for Blind Holes in Wood 3197
Desk Drawers Made of Bread Pans...... 3261
Desk, Strong and Inexpensive, Made for Shop Use 3104
Device for Lifting Barrels to be Emptied 3096
Die-Casting Machine, Homemade....... 3269
Digging Holes in Dry Ground with a Hose 3243
Dirt and Grease on Engine Work, Protecting the Hands from........ 3126
Dirty Places, Cover for Oil Holes in... 3244
Disappearing Stairway, A........ 3275
Dishes, Garden Hose Protects against Chipping and Breaking........ 3221
Disk-Bearing Stand for Balancing Rotary Machine Parts........ 3128
Disks or Rings, Cutting Accurately from Sheet Metal 3162
Dissolving Boiler Scale Saves Fuel and Provides More Heat........ 3253
Divided Window Shades Permit Fine Adjustment of Light 3261
Dividers, Sphere Attachment for, When Measuring from Holes........ 3168
Dividing Concrete Sidewalks, Folding Square for 3197
Door and Window Fitting, Bevel Square for 3206
Door Bumpers, Base Knobs or, Put to Various Uses 3252
Door, Four Men Use Two Padlocks on One 3228
Door Knobs Make Convenient Handles for Bits 3117
Door Latch Controlled from Kitchen Saves Many Steps........ 3230
Door Latch Operated by Sign Reading "No Admittance" 3301
Door, Proper Placing of Three Hinges on 3282
Doors, Double, Pulley Arrangement is Helpful in Operating 3145
Doors Have Removable Panels for Summer and Winter Use........ 3206
Doors, Heavy, Building in Place Saves Trouble of Hanging........ 3254
Dot and Dash Ruler Easily Made...... 3214
Dowel Cutter for the Home Workshop.. 3154
Dowel Pins, Wooden Knitting Needles and, Hollow Mill for Making........ 3190
Draft-Proof Window for Small-Shop Ventilation 3169
Drafting, Fingers for Holding Spline Weights in 3211
Drafting Jobs, Making Special Angles and Curves for 3259
Drafting Table, Convenient Bench for Use at 3155
Drafting Work, Small, Easily Done without a T-Square........ 3291
Draftsman's Time, Ink-Bottle Stopper Lifter Saves 3139
Draftsman's Tools, Handy Rack Holds.. 3254
Draftsman's Triangle, Useful Kinks for Improving the 3277
Draftsman's Triangle with Raised Points or Feet 3296
Draftsmen, Pen Wiper for........ 3283
Drain, Subsurface, Mole Plow Makes without Use of Tile........ 3182
Draining Pipes in an Unoccupied House for the Winter 3234
Drains, Clogged, Cleaning Out with Fluid Pressure 3274
Drains, Small, in Concrete, Made with Pipes 3100
Drawer, Portable Tool 3282
Drawer, Special, for Carpenters' Squares, Hardware Store Has........ 3289
Drawers, Desk, Made of Bread Pans... 3261
Drawers, Sliding, Lubricated Varnish Eliminates Trouble with........ 3260
Drawers under Bench, Vise to Catch Filings 3166
Drawing Paper, Fastening Tightly to the Board 3278
Drawing Sheets, Fixing Compass-Point Centers on 3179
Drawings Superseded by Others Plainly and Promptly Marked........ 3117
Drawings, Weighted Rulers Keep from Rolling When in Use........ 3161
Dressing Circular Saws, Preventing Casehardening in 3138
Drift Pin, Removing Tailstock Centers Easily by Means of........ 3219
Drift Tool for Easy Removal of Taper-Shank Drills 3184
Drill for Enlarging the Bottom of Threaded Holes 3155
Drill Holes, Punch for Laying Out...... 3281
Drill Jig for Formed Flat Pieces...... 3226
Drill Jigs of Cement, Making........ 3237
Drill-Press Attachment for Bench Lathe 3216
Drill Press, Substitute, Vise and Breast Drill Used as........ 3143
Drill, Twist, Alteration Adapts for Soft Metals 3225
Drill Press, Tool for Machining Bosses and Hubs on 3130
Drill Press, Using as a Wood-Turning Lathe 3132
Drilling, Balancing Rotating Machine Parts by 3142
Drilling, Handle for Holding Polished Round Stock for 3187
Drilling Holes in Steel Plates, Rigging Lessens Work of........ 3134
Drilling Holes through Heavy Metal with a Bit Brace........ 3271
Drilling Sheet Metal, Power-Punching or, Spacing Gauge for........ 3173
Drilling Small Sheet-Metal Pieces, Jig for 3177
Drills, Broken, Converting into Lathe Tools 3221
Drills, Drift Tool for Easy Removal of Taper-Shank 3184
Drills, Portable, and Other Heavy Tools, Counterweights on 3228
Dry-Cell Filler, Iron Cement Made from Old 3182
Drying a Lens Properly........ 3280
Drying Out, Keeping Collapsible Tubes Inverted Prevents Contents from..... 3259
Durable Hingeless Field Gate........ 3262
Dust Cap from Tire Valve, Screwdriver Handle Made of........ 3258

Easy-Running T-Square for Vertical Boards 3223
Ebony Finish, Selecting Wood to Take. 3174
Edge, Removable Heavy, for the Bench. 3233
Efficiency, Auto Stop Block Reduced to. 3296
Efficiency Methods, War-Time, Applied to the Dairy Barn........ 3163

Segment-Joining, for the Home orkshop 3202
Wedge-Clamp, Helps Speed Up Pro- ction 3230
and Templates, Large, Painted Red r Identification 3113
, Difficult, Flexible Scraper Makes sy 3191

osene Burner or Stove Readily Made 3244
tle, Large, Inverted over Soft-Coal re Saves Heat 3267
ways, Tool for Laying Out 3193
k, Useful, for Valve-Grinding Jobs.. 3191
hen Cabinet, Sanitary, How to Make 3227
hen Chopping Board, Handy 3302
hen, Door Latch Controlled from, ves Many Steps 3230
hen, Outside Cistern Pump Operated om 3236
hen Range, Quickly Made Gas rner for 3238
hen, Wood Box Built into Wall of. 3249
fe-Switch Contact Blades, Testing.. 3142
tting Needles and Dowel Pins, Wood- , Hollow Mill for Making 3190

or, Pedal Extension on Auto-Jack ever Saves 3214
or-Saving Method of Excavating un- r a Building 3166
der Bucket Jack for Roof Workers, nvenient 3196
der, Calipers for Overhead Work liminate Use of 3174
der, Tools for Handling Electric obes without 3146
le, Old, Improving 3273
ps, Incandescent, Replacing in Lofty iling Fixtures 3279
ps, Keep Clean 3268
ge Objects, Novel Method for Lifting 3203
ne, Accurate Method of Setting read Tool in 3095
ne Bell Center for Turning Tubing.. 3221
ne, Bench, Drill-Press Attachment r 3216
ne Boring Bars, Methods of Holding ols in 3200
ne Chuck, Universal, Used as a Vise 3271
ne, Chuck Which Centers and Drives stons being Machined in 3181
ne, Device for Winding Spiral Springs 3198
ne, Holding Split Patterns in 3280
ne, Inexpensive Belt Sander Made om 3235
s, Moving Easily with Hand Trucks 3245
e, Neat Chest under Holds Tools d Gears 3273
e, Nineteen-Inch, Turning a Fifty- ur-Inch Wheel on 3160
e, Tool Block for Making Small ns on 3107
[illegible] Tools, Converting Broken Drills 3221
[illegible] Wire Used to String Rings as [illegible] from 3205
[illegible] Wood-Turning, Using the Drill [illegible] 3132
[illegible] for Setscrews in Dogs [illegible] 3253
[illegible] rill Holes, Punch for 3281
[illegible] yways, Tool for 3193
[illegible] stairs, Handy Square At- [illegible] 3203
[illegible] Soldiers" Used as Tar- [illegible] 3282
[illegible] ast Securely on Pipe [illegible] 3143
[illegible] Faucet Avoids 3291
[illegible] Solderless Repair [illegible] 3205
[illegible] Holdfast 3176
[illegible] able or Bench 3096
[illegible] 3280
[illegible] nse, Size for [illegible] 3210
[illegible] yors' Tripod [illegible] 3196
[illegible] vel Makes [illegible] 3256
[illegible] of Force [illegible] 3302

Lid is Opened, Tool-Chest Tray Rises When 3278
Lifter, Ink-Bottle Stopper, Saves Draftsman's Time 3139
Lifting Barrels to be Emptied, Device for 3096
Lifting Large Objects, Novel Method for 3203
Lifting Platform and Cradle for Auto Motors Truck with 3131
Light, Automatic Electric Backing-Up Automobile 3210
Light, Divided Window Shades Permit Fine Adjustment of 3261
Lighter for Gas Torch Made from a Spark Plug 3295
Lighting a Fire at the Top Saves Fuel.. 3284
Linen Collars, Old, Make Good Marking Tags 3287
Liners for Linotype Machines, Homemade Built-Up 3114
Linotype Machines, Homemade Built-Up Liners for 3114
Load of Lumber Hauled by Light Car and Hand Truck 3294
Loading Boxes, Piling and, Winch Truck for 3111
Loading Point, Counterweight Returns Block and Tackle to 3129
Loading Truck Facilitates Handling of Auto Chassis 3263
Locating Bolt Holes Where Scriber Cannot be Used 3245
Locator, Magnetic, Useful in Wiring Finished Houses 3300
Lock, Friction, Keep Vise Ball Points from Injuring Fingers 3118
Lock, Spring-Opening, Fitted on Ruling Pen 3296
Lock, Staple Prevents Manipulation of. 3302
Lock Washers, Easily Made 3263
Locomotive-Apron Holder Aids Quick Coupling 3141
Locomotive Steam Used to Clean and Sterilize Well 3183
Loosening Rusty Wood Screws 3185
Loud-Sounding Air Whistle for Camp or Motorboat 3143
Lubricated Varnish Eliminates Trouble with Sliding Drawers 3260
Lubricating Bolt of a Ball Thrust on a Torque Rod 3138
Lubricating Piston Pins on V-Type Engines 3248
Lumber, Load of, Hauled by Light Car and Hand Truck 3294
Lumber, Rough, Pivot Stand Aids in Handling of 3170
Lumber-Saving Kink for Making Split Patterns 3252

Machine, Heavy, Unloading from a Truck 3252
Machine, Homemade Die-Casting 3269
Machine, Homemade, for Cutting Washers and Packings 3144
Machine Nuts Set on Rods with Belting as Wrench 3128
Machine Operations, Tool for Holding Polished Metal Parts in 3103
Machine, Paper-Ornament Making, for Restaurant Use 3150
Machine Parts, Mandrels and Similar, Block for Driving 3147
Machine Parts, Rotating, Balancing by Drilling 3142
Machine Parts, Small, Boring after Grinding 3170
Machine Parts, Small, Painted by Use of Novel Device 3118
Machine Shop, Adjustable Clamping Device for 3158
Machine That Executes Military-Drill Movements 3115
Machinery, Light Foot-Power, Concrete Flywheels for 3140
Machinery, Signs on Idle, Give Reasons for Delay in Production 3126
Machines Oiled at Close of Workday Start Easily in Cold 3134
Machining Two Parts at Once, Planing Tool for 3192
Machinist's Vise, Wooden Caps Convert into Bench Clamp .... [illegible]

Efficient Method of Cleaning Small Pinion Gears 3167
Elbows, Conduit, Device for Bending... 3177
Electric Backing-Up Automobile Light, Automatic 3219
Electric Bells Having Small Transformers, Improvement for........ 3122
Electric Cigar-Case Humidifier........ 3197
Electric Furnaces, Small, for Shop or Laboratory 3145
Electric Globes, Tools for Handling without a Ladder........ 3146
Electric Ignition System Wired to Counteract Loose Connection........ 3179
Electric Hand Warmer for Automobile Steering Wheel 3282
Electric-Light Socket, Improvised 3175
Electric Light, Tin Foil Winding on Bulb Intensifies 3098
Electric-Soldering Tongs 3272
Electrical Shop-Call System, Colored-Light 3197
Electricians' Knives, Old Hacksaw Blades Converted into........ 3143
Electricians' Tape, Renewing Old...... 3256
Electricians' Tools, Handy, Made from Old Hacksaw Blades 3165
Electricity, Gas Water Heater Controlled by 3238
Electromagnet, Improvised, Picks Wrench from Crankcase........ 3276
Electroplating Rack for Small Pieces, Convenient 3208
Electroplating the Inside of a Tube or Casting 3152
Elevator, Portable, Combination Stepladder and 3181
Elevator, Swinging, for Trunks and Light Freight 3293
Elimination of Belt Slippage Conserves Fuel 3218
Emergency Call-Bell System Has Permanent Wiring 3294
Emergency Fuse Repair 3236
Emergency Nut Cast of Babbitt........ 3299
Emery, Powdered, Cone Container Conserves 3229
Emery-Wheel Motors, Pedal Switch for. 3264
Emery Wheels, Safety Washer for Fastening 3177
End Cap of Roofing Rolls, Soap Dish Made from 3237
Engine Bolts, Conical Points for, Simplify Motorcycle Repairs........ 3139
End Centers, Attachment Adapts Tachometer for Shafts without........ 3127
Engine Exhaust, Hot Water for Boat from 3121
Engine, Novel Repair for Cracked Water Jacket on 3127
Engine Pistons, Rusted, Loosening with Hot Water 3120
Engine Work, Protecting the Hands from Dirt and Grease on........ 3126
Engines, Overhead-Valve, Tool for Lifting Rocker Arms on........ 3260
Engines, V-Type, Lubricating Piston Pins on 3248
Enlarging Pistons by Peening to Eliminate Slap 3272
Enlarging the Bottom of Threaded Holes, Drill for 3155
Etching a Hole through Hardened Steel 3139
Etching on Glass and Metal with a Sandblast 3266
Excavating under a Building, Labor-Saving Method of 3166
Exhaust Deflectors Keep Fumes Out of Automobiles 3223
Exploiting Old Photographic Negative Glass 3153
Extension Control for Tractor Aids in Work of Plowing........ 3175
Extinguishing Spontaneous Fire in a Coal Pile 3252
Extractor, Cotter-Pin, Has Hammer Built In 3245
Eye, Easy Method of Removing Foreign Particles from 3156
Eye, Safety Tool Extracts Particles from 3239
Eyelets Handy in Lacing Holes of Light Belts 3104
Eyes, Glass Plate over Buzz Saw Protects 3281

Fabric, Rubber Gum and, Convenient Rack for 3258
Face, Shield on Creeper Protects, When Working under Auto 3148
Factory Smokestacks, Blasting Soot from 3154
Fan, Cooling, Rim Reinforces........ 3102
Fans Belted from Mill Shaft Give Comfort to Workmen........ 3151
Farm, Vessel for Cooking Potatoes for Hogs on 3274
Fasteners, Emergency Corrugated, for Use in Woodwork........ 3159
Fastening Drawing Paper Tightly to the Board 3278
Faucet, Stop on, Avoids Oil Leakage... 3291
Faucets in Washbowls, Foot Control Handy for 3264
Fellies, Wagon-Wheel, Swivel Chair Made from 3256
Fence, Portable, Formed of Easily Detached Sections 3296
Ferrule, Metal, Simple Method of Making and Attaching a........ 3205
Field Gate, Durable Hingeless........ 3262
File Handles Convenient on Large Tee Wrenches 3119
File in Chuck, Burrs inside Tubing and Castings Removed by........ 3196
Files, Cleaning with Block of Wood.... 3147
Files Made of Sandpaper Handy in Woodwork 3151
Files, Old, Made Serviceable by Treating with Acid 3157
Files, Old Rat-Tail, Center Punches Made from 3145
Filing Scraper Blades, Clamping Block for 3258
Filings, Drawers under Bench Vise to Catch 3166
Filler, Shim or, Proper Shape to Cut... 3217
Filling Cans or Buckets, Automatic Shut-Off for 3231
Filling Cracks in Concrete with Putty.. 3201
Filter, Oil, and Tank for the Shop..... 3119
Fingers for Holding Spline Weights in Drafting 3211
Fingers, Friction Lock Keeps Vise Ball Point from Injuring 3118
Finish, Ebony, Selecting Wood to Take.. 3174
Fire, Lighting at Top Saves Fuel...... 3284
Fire, Spontaneous, in a Coal Pile, Extinguishing 3252
Fireproof Concrete Safe, How to Make.. 3306
Firing, Relieve Compression of Cylinder Which is Not 3217
Fish, Harpoon Gun for Spearing, Made from Old Rifle 3151
Fit, Nice, Scraping Babbitt Bearings to. 3112
Fit, Perfect, Chalking a Tap to Get.... 3180
Fitting Bearing Adjustments Accurately 3230
Fitting Metal Gaskets Securely in Bolted Flanges 3099
Fitting Pins Tightly in Oversize Holes. 3223
Fixtures, Lofty Ceiling, Replacing Incandescent Lamps in........ 3279
Flagpole, Substantial 3292
Flanges, Bolted, Fitting Metal Gaskets Securely in 3099
Flanges, Old Gaskets Sawed Out from between 3097
Flash Light on Automobile Steering Column 3229
Flat Pieces, Formed, Drill Jig for...... 3226
Float Mooring, Substantial, for Small Boats 3110
Flue-Cutter Slip-Joint Shaft, Collar for. 3194
Fluid Pressure, Cleaning Out Clogged Drains with 3274
Flutes, Method of Milling in Taps and Reamers 3186
Fluxing, Difficult, Solder Paste for...... 3184
Fly Screen, Device for Stretching over Frames 3167
Fly Screens, Fastening in Sashes with Stove Bolts 3158
Flywheels, Concrete, for Light Foot-Power Machinery 3140
Folds Out of the Way, Chair Shelf...... 3210

Force Pump, Long Lever Eases Action of 3302
Foreign Particles, Easy Method of Removing from the Eye 3156
Forge Fire, Handy Method of Heating Rivets in 3100
Forge of Concrete for Single or Multiple Use 3123
Forms for Concrete Culverts, Wagon Wheels Provide 3108
Formula for Making Strong Asbestos Plaster 3168
Food for Chicks, Poultry Feeder Places Out of Hens' Reach 3250
Foot Control Handy for Faucets in Washbowls 3264
Foot-Power Hammer for Use in Small Shops 3165
Footstool Made from Harness Hooks 3297
Foundry, Barrel Tumbler for Punch Shop or 3292
Fountain-Pen Filler, Using to Fill Ruling Pens 3236
Four Men Use Two Padlocks on One Door 3228
Frame Holds Oilcan and Tilts for Pouring 3261
Frames, Device for Stretching Fly Screen over 3167
Freezing, Keeping Water Trough from 3248
Friction Lock Keeps Vise Ball Points from Injuring Fingers 3118
Frozen Water Pipes, Steam Jet to Thaw 3240
Fruit Trees, Heavily Laden, Braced with Wires 3172
Fuel, Dissolving Boiler Scale Saves, and Provides More Heat 3253
Fuel, Elimination of Belt Slippage Conserves 3218
Fuel, Good, Used Oil from Auto Engines Makes 3279
Fuel, Lighting a Fire at Top Saves 3284
Fuel, Saving in Plant Which Burns Oil 3248
Fuel-Saving Kinks Valuable in the Home 3264
Fuel, Saving on the Gas Range 3282
Fumes, Exhaust Deflectors Keep Out of Automobiles 3223
Fuse Block, Rack near Holds Fuses for Emergency 3162
Fuse Blocks, Tool for Removing and Applying Safely 3140
Fuse Box, Timesaving Magazine, for Experimental Circuits 3218
Fuse Repair, Emergency 3236
Fuses, Rack near Fuse Block Holds for Emergency 3162
Furnace, Hot-Air, Auxiliary Oil Burners in 3247
Furnace, Improvised, for Small Casehardening Jobs 3206
Furnace, Sand, for House Heating Conserves Coal 3209

Garage Air Compressor Made from Discarded Cycle Motor 3166
Garage, Car Leaving Automatically Gives Warning 3232
Garage "Free-Air" Hose at Curbing, Support for 3114
Garbage Can, To Keep Animals from Molesting 3233
Garden Hose Protects Dishes against Chipping and Breaking 3221
Gas Burner for Kitchen Range, Quickly Made 3238
Gas Engines, Old, Improving Compression of 3211
Gas Pipe Guides Nails Driven in Close Quarters 3148
Gas Range, Saving Fuel on 3282
Gas, Saving, in Heating Water 3287
Gas Soldering Torch, Self-Lighting 3190
Gas Torch, Lighter for, Made from a Spark Plug 3295
Gas Water Heater Controlled by Electricity 3238
Gaskets, Metal, Fitting Securely in Bolted Flanges 3099
Gaskets, Old, Sawed Out from between Flanges 3097
Gasoline Filter, Chamois-Skin, Avoids Carburetor Troubles 3260
Gasoline Gauges, Calibrating Automobile 3212
Gasoline-Torch Piston Leathers, Making 3287
Gate, Durable Hingeless Field 3262
Gate Hinge, Springless Self-Closing 3283
Gauge, Handy, Coin Is, for Spark-Plug Gap 3118
Gauge, Homemade, for Irregular Curves 3122
Gauge, Measuring, for Power Hacksaw 3301
Gauge, Spacing, for Power-Punching or Drilling Sheet Metal 3173
Gauge Stick Useful for Alining Automobile Wheels 3157
Gauge Tells Height of Water in Elevated Tank 3224
Gauges, Calibrating Automobile Gasoline 3212
Gear Patterns, Making Emergency 3184
Gear Puller Cheaply Made from an Old Metal Screw Clip 3204
Gears, Broken, Patching Teeth into 3117
Gears, Small Pinion, Efficient Method of Cleaning 3167
"German Soldiers," Lead, Used as Targets 3282
Germination, Testing Seed Corn for 3288
Glass and Metal, Etching on with a Sandblast 3266
Glass, Boring Large Holes in 3220
Glass, Exploiting Old Photographic Negative 3153
Glass Plate over Buzz Saw Protects Eyes 3281
Glass, Small Piece of, Useful in Tool Grinding 3254
Good and Bad Scraper Edges 3300
Gooseberry Picking, Comb for, Saves Time and Fingers 3225
Gouges, Revolving Cone for Sharpening All Sizes of 3129
Grain, Making Wood Screws Hold When Parallel to 3273
Grease Cup, Loose, Holding on a Clutch 3133
Grease Cup to Contain Ink for Proof Press 3211
Grinding, Boring Small Machine Parts after 3170
Grip, Hoisting Hook Has Instantaneous Positive 3176
Groove Plane Made from Rip Saw 3271
Grooved Pulley Made of Barrel Heads 3262
Ground, Dry, Digging Holes in, with a Hose 3243
Guards, Tin, for Edges of Chisels 3137
Guide for Inserting Piston Rings in Cylinders 3133
Guideboards Are Great Aid for Correct Saw Filing 3179

Hacksaw Blades, Handy Electrician's Tools Made from 3165
Hacksaw Blades, Old, Converted into Electrician's Knives 3143
Hacksaw Blades with Broken Teeth, Using 3229
Hacksaw, Depth Gauge for 3119
Hacksaw, Power, Measuring Gauge for 3301
Hammer Built In, Cotter-Pin Extractor Has 3245
Hammer, Foot-Power, for Use in Small Shops 3165
Hammer Handles, Prolonging the Life of 3162
Hammer-Head Holdfast 3185
Hammer, Inspectors' Stamp Built into 3297
Hand Clamp, Three-Way, Has Many Uses 3144
Hand, One, Caldron Pours Molten Metal with 3133
Hand Plow Rigged in Bicycle Frame 3100
Hand Punches, Using High-Speed Steel for 3241
Hand, Soldering-Iron Shield Protects from Dripping Solder 3160
Hand Trucks, Moving Lathe Easily with 3245
Hand Warmer, Electric, for Automobile Steering Wheel 3282
Handle, Convenient Homemade Scraper 3161
Handle, Detachable, Convenient for Paint Buckets 3103
Handle for Bits for Close Work 3204
Handle for Holding Polished Round Stock for Drilling 3187
Handle for Scraper Blades 3281
Handle for Tool Box, Excellent, Bit Brace Makes 3243

Handles, Carrying Piano Made Easy by 3302
Handle, Emergency, for Screwdriver... 3224
Handles for Bits, Convenient, Door Knobs Make 3117
Handles for Pliers and Other Tools, Insulating 3283
Handling of Auto Chassis, Loading Truck Facilitates 3263
Handling of Rough Lumber, Pivot Stand Aids in 3170
Hands, Moving, Scarecrow with........ 3299
Hands, Protecting from Dirt and Grease on Engine Work........................ 3126
Handsaw Fitted with Attachment for Use as Square 3251
Handy Outfit, Shoe Shining at Home Made Easy by 3276
Hanging, Building Heavy Doors in Place Saves Trouble of.............. 3254
Hanging Oilcan Handy for Overhead Work 3107
Hard Wood, Handy Tool Drives Small Nails into 3156
Hardening Long, Thin Pieces without Warping 3300
Harness Hooks, Footstool Made from... 3297
Harpoon Gun for Speari
from Old Rifle ....
Hardware Store Has Spec
Carpenters' Squares ..
Head-Fitting and Bar-Fas
for Motorcycle ....
Head, Headrest for Auto Mechan
Strapped to His 3296
Headrest for Auto Creeper Made from Inner Tube 3246
Headrest for Auto Mechanic Strapped to His Head 3296
Heat and Coal, Partitioning Off a Room to Save 3258
Heat, Dissolving Boiler Scale Saves Fuel and Provides More 3253
Heat, Large Kettle Inverted over Soft-Coal Fire Saves 3267
Heater, Automobile-Exhaust, Mounted in Floor Register 3251
Heating Device, Suspension, for Small Utensils 3147
Heating, House, Sand Furnace for, Conserves Coal 3209
Heating Rivets in Forge Fire, Handy Method of 3100
Heating Unit, Automobile Radiator as a 3204
Heating Water, Saving Gas in......... 3287
Heel Block, Ankle Strains in Driving Relieved by 3113
Height of Water in Elevated Tank, Gauge Tells 3224
Hens' Reach, Poultry Feeder Places Food for Chicks Out of.................. 3250
Hexagonal Stock, Jaws for Holding in Chuck 3109
High-Speed Steel for Hand Punches, Using 3241
Highways, Concrete, Wooden Roller Aids Construction of 3159
Hinge, Springless Self-Closing Gate.... 3283
Hingeless Field Gate, Durable 3262
Hinges, Rattling of Automobile Doors Overcome by Setting................ 3097
Hinges, Three, Proper Placing of, on a Door 3282
Hog House of Saw-Tooth Design, Sanitary 3149
Hogs on the Farm, Vessel for Cooking Potatoes for 3274
Hogs, Snout Snare Makes It Easy to Ring 3225
Hoisting Hook Has Instantaneous Positive Grip 3176
Holder and Pick-Up Tool for Cotter Pins 3242
Holder, Locomotive-Apron, Aids Quick Coupling 3141
Holdfast, Hammer-Head 3185
Holding Split Patterns in the Lathe.... 3280
Hole, Etching through Hardened Steel. 3139
Hole, Tapping without a Tap.......... 3210
Holes Drilled through Brick and Mortar 3179
Holes, Drilling through Heavy Metal with a Bit Brace.................... 3271
Holes in Dry Ground, Digging with a Hose 3243
Holes in Steel Plates, Rigging Lessens Work of Drilling 3124
Holes, Large, Boring in Glass.......... 3230
Holes, Large, Reaming with an Ordinary Twist Drill 3237
Holes of Light Belts, Eyelets Handy in Lacing 3164
Holes, Oversize, Fitting Pins Tightly in 3223
Holes, Sphere Attachment for Dividers When Measuring from.............. 3161
Home, Fuel-Saving Kinks Valuable in.. 3286
Home or Shop Use, Simple Pipe Bender for 3169
Hood for a Soldering Iron, Asbestos.... 3292
Hook Fitted to Hand Truck Holds Boxes 3103
Hook Supports for Threading and Fitting Long Pipes 3139
Hopper, Sorting, for Berries and Small Vegetables 3123
Hose, Clogged Spout Readily Cleaned with 3222
Hose, Digging Holes in Dry Ground with 3243
Hose, Garage "Free-Air," Support for, at Curbing 3114
Hot-Air Furnace, Auxiliary Oil Burners in 3247
ater for the Boat from Engine
ust 3121
ater, Loosening Rusted Engine
ns with 3129
Heating, Sand Furnace for, Con-
s Coal 3209
Unoccupied, Draining Pipes in,
ne Winter 3234
Finished, Magnetic Locator Use-
n Wiring 3200
p, Removing Automobile Wheels
.... 3244
ier, Electric Cigar-Case.......... 3197
lic Pump Is Independent of
r Levels 3135

ation, Large Jigs and Templates
ed for 3113
ations, Serial-Number, on Work-
rawings Save Time.............. 3133
Distributor of Auto Engine,
er Tube Protects.............. 3128
Ig System, Electric, Wired to
Co eract Loose Connections 3179
Impr ng an Old Ladle.............. 3273
Impr ng the Draftsman's Triangle, Useful Kinks for 3277
Incandescent Lamps in Lofty Ceiling Fixtures, Replacing 3279
Inch, The Thousandth of.............. 3281
Indicator on Work in Chuck, Micrometer Used as 3128
Inexpensive Belt-Sander Made from a Lathe 3235
Inflating Tires with Air by Use of City Water Pressure 3169
Injury, Tray for Moving Small Threaded Parts without 3167
Ink-Bottle Stopper Lifter Saves Draftsman's Time 3139
Ink for Proof Press, Grease Cup to Contain 3211
Ink Pad, Handy Rubber-Stamp, for the Shop Office 3194
Inner Tube, Headrest for Auto Creeper Made from 3246
Inspectors' Stamp Built into Hammer.. 3297
Insulating Handles for Pliers and Other Tools 3283
Interference by Children, Push Button Locked against 3256
Invalids' Table Rests on Bed........... 3299
Iron and Brass Castings, Softening Hard 3190
Iron Cement Made from Old Dry-Cell Filler 3182
Iron, Soldering Electrically without.... 3106
Ironing Board with Novel Features.... 3222
Irregular Outline, Band Sa
Paper Labels of ....

Jackscrew, Adjustable S
Substitute for ...
Jaws for Holding H
Chuck ....
Jig for Drilling S
Jig for Holdin
Drilled ....

Jig, Segment-Joining, for the Home Workshop 3202
Jig, Wedge-Clamp, Helps Speed Up Production 3230
Jigs and Templates, Large, Painted Red for Identification 3113
Jobs, Difficult, Flexible Scraper Makes Easy 3191

Kerosene Burner or Stove Readily Made 3244
Kettle, Large, Inverted over Soft-Coal Fire Saves Heat 3267
Keyways, Tool for Laying Out........ 3193
Kink, Useful, for Valve-Grinding Jobs.. 3191
Kitchen Cabinet, Sanitary, How to Make 3227
Kitchen Chopping Board, Handy........ 3302
Kitchen, Door Latch Controlled from, Saves Many Steps 3230
Kitchen, Outside Cistern Pump Operated from 3236
Kitchen Range, Quickly Made Gas Burner for 3238
Kitchen, Wood Box Built into Wall of. 3249
Knife-Switch Contact Blades, Testing.. 3142
Knitting Needles and Dowel Pins, Wooden, Hollow Mill for Making........ 3190

Labor, Pedal Extension on Auto-Jack Lever Saves 3214
Labor-Saving Method of Excavating under a Building 3166
Ladder Bucket Jack for Roof Workers, Convenient 3196
Ladder, Calipers for Overhead Work Eliminate Use of 3174
Ladder, Tools for Handling Electric Globes without 3146
Ladle, Old, Improving 3273
Lamps, Incandescent, Replacing in Lofty Ceiling Fixtures 3279
Lamps, Keep Clean 3268
Large Objects, Novel Method for Lifting 3203
Lathe, Accurate Method of Setting Thread Tool in 3095
Lathe Bell Center for Turning Tubing.. 3221
Lathe, Bench, Drill-Press Attachment for 3216
Lathe Boring Bars, Methods of Holding Tools in 3200
Lathe Chuck, Universal, Used as a Vise 3271
Lathe, Chuck Which Centers and Drives Pistons being Machined in........ 3181
Lathe, Device for Winding Spiral Springs on 3198
Lathe, Holding Split Patterns in........ 3280
Lathe, Inexpensive Belt Sander Made from 3235
Lathe, Moving Easily with Hand Trucks 3245
Lathe, Neat Chest under Holds Tools and Gears 3273
Lathe, Nineteen-Inch, Turning a Fifty-Four-Inch Wheel on 3160
Lathe, Tool Block for Making Small Pins on 3107
Lathe Tools, Converting Broken Drills into 3221
Lathe, Wire Used to String Rings as They Come from 3205
Lathe, Wood-Turning, Using the Drill Press as 3132
Lathe, Wrench for Setscrews in Dogs Attached to 3253
Laying Out Drill Holes, Punch for........ 3281
Laying Out Keyways, Tool for........ 3193
Laying Out Stairs, Handy Square Attachment for 3203
Lead "German Soldiers" Used as Targets 3282
Lead Mallet Head Cast Securely on Pipe Handle 3143
Leakage, Oil, Stop on Faucet Avoids.... 3291
Leaks, Boiler, Durable Solderless Repair for 3205
Leather-Belting Cement, Holdfast 3176
Leg, Adjustable, for Table or Bench.... 3096
Lens, To Dry Properly........ 3280
Letters, Aluminum Bronze, Size for Holding 3210
Level, Carpenters', Surveyors' Tripod Level Made Quickly from........ 3196
Lever-and-Fulcrum Snow Shovel Makes Heavy Shoveling Easy 3256
Lever, Long, Eases Action of Force Pump 3302
Lid is Opened, Tool-Chest Tray Rises When 3278
Lifter, Ink-Bottle Stopper, Saves Draftsman's Time 3139
Lifting Barrels to be Emptied, Device for 3096
Lifting Large Objects, Novel Method for 3203
Lifting Platform and Cradle for Auto Motors Truck with 3131
Light, Automatic Electric Backing-Up Automobile 3210
Light, Divided Window Shades Permit Fine Adjustment of 3261
Lighter for Gas Torch Made from a Spark Plug 3295
Lighting a Fire at the Top Saves Fuel.. 3284
Linen Collars, Old, Make Good Marking Tags 3287
Liners for Linotype Machines, Homemade Built-Up 3114
Linotype Machines, Homemade Built-Up Liners for 3114
Load of Lumber Hauled by Light Car and Hand Truck........ 3294
Loading Boxes, Piling and, Winch Truck for 3111
Loading Point, Counterweight Returns Block and Tackle to........ 3129
Loading Truck Facilitates Handling of Auto Chassis 3263
Locating Bolt Holes Where Scriber Cannot be Used 3245
Locator, Magnetic, Useful in Wiring Finished Houses 3300
Lock, Friction, Keep Vise Ball Points from Injuring Fingers 3118
Lock, Spring-Opening, Fitted on Ruling Pen 3296
Lock, Staple Prevents Manipulation of. 3302
Lock Washers, Easily Made 3263
Locomotive-Apron Holder Aids Quick Coupling 3141
Locomotive Steam Used to Clean and Sterilize Well 3183
Loosening Rusty Wood Screws........ 3185
Loud-Sounding Air Whistle for Camp or Motorboat 3143
Lubricated Varnish Eliminates Trouble with Sliding Drawers 3260
Lubricating Bolt of a Ball Thrust on a Torque Rod 3138
Lubricating Piston Pins on V-Type Engines 3248
Lumber, Load of, Hauled by Light Car and Hand Truck 3294
Lumber, Rough, Pivot Stand Aids in Handling of 3170
Lumber-Saving Kink for Making Split Patterns 3252

Machine, Heavy, Unloading from a Truck 3252
Machine, Homemade Die-Casting........ 3269
Machine, Homemade, for Cutting Washers and Packings........ 3144
Machine Nuts Set on Rods with Belting as Wrench 3128
Machine Operations, Tool for Holding Polished Metal Parts in........ 3103
Machine, Paper-Ornament Making, for Restaurant Use 3150
Machine Parts, Mandrels and Similar, Block for Driving........ 3147
Machine Parts, Rotating, Balancing by Drilling 3142
Machine Parts, Small, Boring after Grinding 3170
Machine Parts, Small, Painted by Use of Novel Device 3118
Machine Shop, Adjustable Clamping Device for 3158
Machine That Executes Military-Drill Movements 3115
Machinery, Light Foot-Power, Concrete Flywheels for 3140
Machinery, Signs on Idle, Give Reasons for Delay in Production........ 3126
Machines Oiled at Close of Workday Start Easily in Cold........ 3134
Machining Two Parts at Once, Planing Tool for 3192
Machinist's Vise, Wooden Caps Convert into Bench Clamp .... 315[illegible]

Magazine Fuse Box, Timesaving, for Experimental Circuits 3218
Magnetic Locator Useful in Wiring Finished Houses 3300
Magnetic, Making Screwdriver.......... 3301
Magnetic Tack Hammer Is Electrically Operated 3146
Magneto, Motor Timer and, Oiling Properly 3152
Mallet Head, Lead, Cast Securely on Pipe Handle 3143
Mandrel for Truing the Faces of Nuts.. 3171
Mandrels and Similar Machine Parts, Block for Driving 3147
Manifold Heater, Acetylene, Starts Cold Auto Engines 3225
Manipulation of Lock, Staple Prevents.. 3302
Maple, Oil-Soaked, Emergency Bearing for Tractor Made from............... 3176
Mapping Surveyor's Data, Device for... 3104
Marking Tags, Good, Old Linen Collars Make 3287
Marks, Square-Point Center Punch Handy for Revising................... 3108
Materials, Common, Sprayer or Air Brush Easily Made from............ 3208
Measuring from Holes, Sphere Attachment for Dividers When............. 3168
Measuring Gauge for Power Hacksaw.. 3301
Mechanic, Auto, Headrest for Strapped to His Head 3296
Mechanic's Clothes Laundered by Exhaust Steam 3279
Mechanics in Shop, Check-Out Board Helps Locate 3096
Mechanic's Tool Case Made from a Suitcase 3226
Mending Torn Tracings................ 3148
Mercury Cups, Switch Reversed by Tilting 3242
Metal Bucket, Welding Mask Made from 3126
Metal Ferrule, Simple Method of Making and Attaching a.................... 3205
Metal, Heavy, Drilling Holes through with a Bit Brace.................... 3271
Metal, Molten, Caldron Pours with One Hand 3133
Metal Parts, Polished, Tool for Holding in Machine Operations 3103
Metals, Soft, Alteration Adapts Twist Drill for 3225
Method, Accurate, of Setting Thread Tool in Lathe....................... 3095
Metric Measures, Quick Methods of Converting 3192
Micrometer Used as Indicator on Work in Chuck 3128
Military-Drill Movements, Machine That Executes 3115
Milk-Bottle Cover 3300
Mill, Hollow, for Making Wooden Knitting Needles and Dowel Pins......... 3189
Mill Shaft, Fans Belted from, Give Comfort to Workmen 3151
Milling Flutes in Taps and Reamers, Method of 3186
Minnow Net, Large, Made of Branches and Netting 3112
Mirror, Pocket, Useful in the Shop..... 3278
Miter Box, How to Do Miter-Box Work without 3237
Miter Box, Sandpaper Prevents Slipping of Work in 3118
Miter Box, Wooden, with Many Uses... 3141
Miter-Box Work, How to Do without a Miter Box 3237
Miter Boxes, Wooden, Depth Gauge for. 3214
Mold for Solder Easily Made of Plaster of Paris 3219
Moldings, Dentil, for Cabinet Trim, Making 3098
Mole Plow Makes Subsurface Drain without Use of Tile................... 3182
Moisture, Method of Protecting Terminals from 3139
Mooring, Substantial Float, for Small Boats 3110
Motor, Air-Cooled, Water-Jacketing an 3189
Motor Car, Thermometer for Water-Cooling System of 3160
Motor, Discarded Cycle, Garage Air Compressor Made from.............. 3166
Motor Fields, Tool for Packing Wires in Slots of 3096
Motor Journal Bearings, Efficient Method of Testing 3173
Motor, Pipe Aids in Removing Armature of 3124
Motor-Starting and Regulating Switch.. 3163
Motor Timer and Magneto, Oiling Properly 3152
Motorboat, Loud-Sounding Air Whistle for Camp or 3143
Motorcycle, Adjustable Valve-Spring Tension Adapts for High Speed...... 3132
Motorcycle Back Rest to Carry Camera. 3236
Motorcycle, Head-Fitting and Bar-Fastening Repair for............... 3152
Motorcycle Piston, Broken, Emergency Repair for 3150
Motorcycle Repairs, Conical Points for Engine Bolts Simplify 3139
Motors, Emery-Wheel, Pedal Switch for 3264
Mountain Stream, Small Water-Supply Reservoir Built in................... 3117
Mouse Trap, Using a Barrel as......... 3257
Movable Posts Made of Pipe Useful in Stock Rooms 3284
Moved, How Big Tree is............... 3290
Moving a Crippled Automobile Single-Handed 3234
Moving a Lathe Easily with Hand Trucks 3245
Moving Hands, Scarecrow with......... 3299
Moving Heavy Stones into Place on a Wall 3249
Moving "Rusted-In" Screws............ 3267
Moving Stove, Small Truck Aids in..... 3268
Mud Hole, Novel Method of Getting Tractor Out of 3172

Nail Makes Satisfactory Plow-Plane Bit 3302
Nails Driven in Close Quarters, Gas Pipe Guides 3148
Nails, Preventing from Splitting Wood. 3261
Nails, Scaffolding without 3268
Nails, Small, Handy Tool Drives into Hard Wood 3156
Net, Large Minnow, Made of Branches and Netting 3112
Nipple, Broken, Removing from a Coupling 3212
Novel Device, Small Machine Parts Painted by Use of................... 3118
Novel Features, Ironing Board with... 3222
Nut, Emergency, Cast of Babbitt....... 3299
Nut, Threading Die Made from........ 3246
Nuts, Faces of, Mandrel for Truing..... 3171

Oil Burners, Auxiliary, in a Hot-Air Furnace 3247
Oil Conserved by Using Soapy Water... 3169
Oil Discharged by Pressure Eliminates Lifting Barrel 3154
Oil Filter and Tank for the Shop...... 3119
Oil Holes in Dirty Places, Cover for.... 3244
Oil Leakage, Stop on Faucet Avoids.... 3291
Oil Level in Automobile Crank Cases, Testing 3220
Oil, Saving Fuel in Plant Which Burns 3248
Oil, Storing Air Hammers in Improves Working Quality 3212
Oil, Used, from Auto Engines Makes Good Fuel 3279
Oil, Wood Inserts in Pulley Bushing Conduct 3120
Oilcan and Bicycle Pump, Blowtorch Made of 3159
Oilcan, Frame Holds and Tilts for Pouring 3261
Oilcan, Hanging Handy for Overhead Work 3107
Oilcans, Old Rectangular, Making Use of 3240
Oiling Motor Timer and Magneto Properly 3152
Oiling Systems, Reliable, for Chain-Driven Trucks 3215
One at a Time, Cigarette Box Deals Out 3201
One-Piece Pipe Wrench Made from Bar Steel 3243
Open and Close Cellar Windows, Timesaving Device to .... [illegible]
Orifice, Enlarged, Renewing in Burner. [illegible]
Outside Cistern Pump Operated from the Kitchen .... [illegible]

Overhanging Edge on Roofing Found Superior 3103
Overhead-Valve Engines, Tool for Lifting Rocker Arms on..... 3260
Overhead Work, Calipers for, Eliminate Use of Ladder 3174
Overhead Work, Hanging Oilcan Handy for 3107

Packing for Pumps and Fittings, Roofing Paper as 3109
Padlock, Screw Eyes Carry..... 3287
Padlocks, Two, Four Men Use on One Door 3228
Pail, Wire Soldered over Mouth of Saves Paint 3147
Paint Buckets, Detachable Handle Convenient for 3103
Paint, Solution for Removal of..... 3186
Paint, Wire Soldered over Mouth of Pail Saves 3147
Paper Labels of Irregular Outline, Band Saw Cuts Out 3194
Paper-Ornament Making Machine for Restaurant Use 3150
Paper Shim Makes Worn Taper Grip Tightly 3221
Panels, Removable, for Summer and Winter Use, Doors Have..... 3206
Pans, Bread, Desk Drawers Made of..... 3261
Paraffin for Woodworking Tools..... 3155
Paraffin Grease for Auto and Wagon Springs 3217
Paraffin, Keeping Brushes Soft with..... 3268
Particles, Safety Tool Extracts from the Eye 3239
Partitioning Off a Room to Save Heat and Coal 3258
Patching Dents in Boat Hulls, Cement Mixture for 3132
Pattern Maker's Boring Tool for Small, Deep Work 3148
Patterns, Split, Holding in the Lathe..... 3280
Patterns, Split, Lumber-Saving Kink for Making 3252
Pedal-Control Wire-Stripping Bench Tool 3113
Pedal Extension on Auto-Jack Lever Saves Labor 3214
Pedal Switch for Emery-Wheel Motors..... 3264
Peening, Enlarging Pistons by to Eliminate Slap 3272
Pencil Tracings, Washing Off after Blueprinting Saves Cloth 3145
Pen Wiper for Draftsmen..... 3283
Perforator, Keeping Small Punchings from Sticking to 3276
Photographic Negative Glass, Exploiting Old 3153
Piano, Carrying Made Easy by Handles 3302
Picture Hook, Safety Pin Makes Good..... 3212
Pieces, Long, Thin, Hardening without Warping 3300
Pigs, Young, Railing Protects from being Crushed 3240
Piling and Loading Boxes, Winch Truck for 3111
Pillar, Repairing with Cement 3254
Pinch Bar Made from Buggy Axle..... 3257
Pins, Fitting Tightly in Oversize Holes 3223
Pins, Small, Tool Block for Making on Lathe 3107
Pipe Aids in Removing Armature of Motor 3124
Pipe Bender, Simple, for Home or Shop Use 3169
Pipe Cutter Used to Strip Heavy Covered Cable 3134
Pipe, Easy Method of Connecting Sections of 3160
Pipe Ends, Cast-Iron, Closing without a Plug 3260
Pipe Fittings, Acid-Proof Cement for..... 3159
Pipe Fittings, Steam Whistle Made from 3279
Pipe Handle, Lead Mallet Head Cast Securely on 3143
Pipe, Heavy, Apparatus of Simple Construction for Bending 3185
Pipe Joints, Cements for 3127
Stock Rooms 3284
Pipe Wrench, One-Piece, Made from Bar Steel 3243
Pipes, Ends of, Device for Plugging under Pressure Tests 3130
Pipes in an Unoccupied House, Draining for the Winter 3234
Pipes, Long, Hook Supports for Threading and Fitting 3138
Pipes, Small Drains in Concrete Made with 3100
Pipes, Small Polished, Wrench for..... 3204
Pistol Grip, Homemade, for Surveyors' Tape 3114
Piston, Broken Motorcycle, Emergency Repair for 3150
Piston Leathers, Gasoline-Torch, Making 3287
Piston, Old, Bench Grinder or Polishing Head Made from 3249
Pipe, Movable Posts Made of, Useful in
Piston, Old, Used to Polish Rebored Cylinders 3233
Piston Pins on V-Type Engines, Lubricating 3248
Piston Rings, Guide for Inserting in Cylinders 3133
Piston Rings, Tool for Removing Step-Cut 3140
Piston, Worn-Out, Used as Blowtorch Furnace 3161
Pistons being Machined in Lathe, Chuck Which Centers and Drives..... 3181
Pistons, Enlarging by Peening to Eliminate Slap 3272
Pistons, Rusted Engine, Loosening with Hot Water 3120
Pivot Stand Aids in Handling of Rough Lumber 3170
Placing of Three Hinges on a Door, Proper 3282
Plane, Groove, Made from Rip Saw..... 3271
Planing Chair Cane, Method of..... 3157
Planing Tool for Machining Two Parts at Once 3192
Plant, Small, Thermometers Save Coal in 3250
Plant Which Burns Oil, Saving Fuel in 3248
Plaster of Paris, Mold for Solder Easily Made of 3219
Plaster, Strong Asbestos, Formula for Making 3168
Plaster Walls, Sawing through..... 3277
Platform, Useful, for Weighing Sacks on Steelyard Scales 3187
Play in Auto Drive Shaft, Spring End Bearings Overcome 3134
Pliers and Other Tools, Insulating Handles for 3283
Pliers, Side-Cutting, Cutting Small Copper Tubes with 3165
Plow, Hand, Rigged in Bicycle Frame..... 3100
Plow-Plane Bit, Satisfactory, Nail Makes 3302
Plowing, Extension Control for Tractor Aids in Work of..... 3175
Plug, Closing Cast-Iron Pipe Ends without 3260
Plugging Ends of Pipes under Pressure Tests, Device for 3130
Pneumatic Riveter Useful in Wood Shop 3215
Points or Feet, Raised, Draftsman's Triangle with 3296
Pole Step, Temporary, Made from Two Spikes 3244
Polish Rebored Cylinders, Old Piston Used to 3233
Polishing Head, Bench Grinder or, Made from Old Piston 3249
Polishing, Rod for Holding Scissors Blades While 3185
Porcelain Tubes, Breaking Squarely..... 3100
Portable Fence Formed of Easily Detached Sections 3295
Portable Tool Drawer 3282
Portable Water-Heater Outfit Made from a Barrel 3199
Posts, Movable, Made of Pipe Useful in Stock Rooms 3284
Potatoes, Boiling to Loosen Boiler Scale 3277
Potatoes, Vessel for Cooking for Hogs on the Farm 3274
Poultry Feeder Places Food for Chicks Out of Hens' Reach 3250
Pouring, Frame Holds Oilcan and Tilts for 3261
Power Hacksaw, Measuring Gauge for..... 3301
Power of an Auto Engine, Increasing..... 3216

Power-Punching or Drilling Sheet Metal, Spacing Gauge for 3173
Pressure for a Soldering Torch, Tire Used to Furnish 3183
Pressure, Oil Discharged by, Eliminates Lifting Barrel 3154
Pressure Tests, Device for Plugging Ends of Pipes under 3130
Primed, Siphon That is Easily Kept.... 3109
Production, Signs on Idle Machinery Give Reasons for Delay in.......... 3126
Production, Wedge-Clamp Jig Helps Speed Up 3230
Projecting Machines, Automatic Signaling Device for 3178
Proof Press, Grease Cup to Contain Ink for 3211
Protecting Terminals from Moisture, Method of 3139
Protecting the Hands from Dirt and Grease on Engine Work.............. 3136
Protection against Wear, Shellac Gives 3216
Protection, Wires across Barrel Heads Give 3297
Pulley Arrangement Is Helpful in Operating Double Doors 3145
Pulley Bushing, Wood Inserts in, Conduct Oil 3120
Pulley, Grooved, Made of Barrel Heads 3262
Pulleys, Worn Loose, Replaced by Adjoining Set Pulleys 3109
Pump Cylinder, Buggy Hub Used for Repairing Worn Threads of......... 3180
Pump, Force, Long Lever Eases Action of 3302
Pump, Hydraulic, Is Independent of Water Levels 3135
Pump-Jack Rods, Efficient Method of Recovering 3175
Pumps and Fittings, Roofing Paper as Packing for 3109
Pumps of Centrifugal and Screw Type Work Together 3279
Punch-and-Die Attachment for a Bench Vise, Making 3195
Punch for Laying Out Drill Holes..... 3281
Punch Shop or Foundry, Barrel Tumbler for 3292
Punchings, Small, Keeping from Sticking to the Perforator.............. 3276
Punches, Center, Made from Old Rat-Tail Files 3145
Push Button Locked against Interference by Children 3256
Putty, Filling Cracks in Concrete with 3201

Quick-Releasing Tapeline Holder does Not Snag Readily 3155

Rack, Convenient Electroplating, for Small Pieces 3208
Rack for Flat Tools 3118
Rack for Rubber Gum and Fabric, Convenient 3258
Rack for Washers 3272
Rack, Handy, Holds Draftsman's Tools 3254
Rack near Fuse Block Holds Fuses for Emergency 3162
Radiator, Automobile, as a Heating Unit 3204
Radiator, Old Auto, Converted into Shop Water Heater 3107
Railing Protects Young Pigs from being Crushed 3240
Rake, Snow Scraper Made from....... 3253
Rat-Tail Files, Old, Center Punches Made from 3145
Ratchet Brace Remodeled for Work in Cramped Spaces 3242
Rattling of Automobile Doors Overcome by Setting Hinges 3097
Rattling of Automobile Hood, Rubber Hose Stops 3147
Reamer for Accurate Work in Wood... 3173
Reaming Large Holes with an Ordinary Twist Drill 3297
Rear of Truck, Crane at, Helps Load and Unload 3298
Recesses, Round, Easily Cut with Homemade Tool 3156
Rectangular Oilcans, Making Use of Old 3240
Red, Large Jigs and Templates Painted for Identification 3113
Refinishing, Chuck Holds Auto Timers for .... [illegible]
Register, Floor, Automobile-Exhaust Heater Mounted in .... [illegible]
Reinforced-Concrete Cistern Cap....... [illegible]
Removable Heavy Edge for the Bench.. [illegible]
Removal of Paint, Solution for........ [illegible]
Removal of Taper-Shank Drills, Easy, Drift Tool for .... [illegible]
Removing a Boiler Flue, Easy Method of .... [illegible]
Removing a Broken Nipple from a Coupling .... [illegible]
Removing Automobile Wheels from Axle, Device for .... [illegible]
Removing Automobile Wheels with the Hub Cap .... [illegible]
Removing Foreign Particles from the Eye, Easy Method of.............. [illegible]
Removing Old Babbitt Metal from Bearing Boxes .... [illegible]
Removing Tailstock Centers Easily by Means of Drift Pin .... [illegible]
Removing Wall Paper with Steam..... [illegible]
Renewing Enlarged Orifice in Burner... [illegible]
Renewing Old Electricians' Tape....... [illegible]
Renewing Valve Guides in Auto Engines .... [illegible]
Repair, Effective Emergency, for Automobile Wheel .... [illegible]
Repair, Emergency, for a Broken Motorcycle Piston .... [illegible]
Repair, Emergency, for a Crankshaft with a Cracked Web .... [illegible]
Repair, Emergency Fuse .... [illegible]
Repair, Emergency Spark-Plug......... 3177
Repair for Boiler Leaks, Durable, Solderless .... [illegible]
Repair for Motorcycle, Head-Fitting and Bar-Fastening .... [illegible]
Repair, Novel, for Cracked Water Jacket on Engine .... [illegible]
Repairing a Cracked Water Jacket with Cement .... [illegible]
Repairing a Pillar with Cement........ [illegible]
Replacing Incandescent Lamps in Lofty Ceiling Fixtures .... [illegible]
Reservoir, Small Water-Supply, Built in Mountain Stream 3117
Respirator Made of Cotton and Muslin.. [illegible]
Restaurant Use, Paper-Ornament Making Machine for 3150
Revolving Cone for Sharpening All Sizes of Gouges 3129
Rifle, Old, Harpoon Gun for Spearing Fish Made from 3151
Rigging Lessens Work of Drilling Holes in Steel Plates 3134
Rim Reinforces Cooling Fan 3102
Rims, Split, Serviceable Tire Remover for Cars Equipped with............ 3172
Rings, Wire Used to String, as They Come from Lathe 3296
Rip Saw, Groove Plane Made from.... 3271
Ripping, Method of Preventing Binder Canvas from 3171
Riveter, Pneumatic, Useful in Wood Shop 3215
Rivets, Handy Method of Heating in Forge Fire 3100
Rocker Arms on Overhead-Valve Engines, Tool for Lifting.............. [illegible]
Rod for Holding Scissors Blades While Polishing 3185
Rod, Round, to be Drilled, Jig for Holding 3196
Rods, Machine Nuts Set on, with Belting as Wrench .... [illegible]
Rods, Pump-Jack, Efficient Method of Recovering 3175
Roller, Wooden, Aids Construction of Concrete Highways .... [illegible]
Roof Workers, Convenient Ladder Bucket Jack for .... [illegible]
Roofing Cement, Staining Wood a Dark Color .... [illegible]
Roofing, Overhanging Edge on Four Superior ....
Roofing Paper as Packing for Pumps Fittings ....
Roofing Rolls, Soap Dish Made Cap of ....
Room, Partitioning Off to Coal ....

Rotary Machine Parts, Disk-Bearing Stand for Balancing 3128
Round Recesses Easily Cut with Homemade Tool 3156
Rubber Cement for Repairing Tire Valve 3295
Rubber Gum and Fabric, Convenient Rack for 3258
Rubber Hose Stops Rattling of Automobile Hood 3147
Rubber-Stamp Ink Pad, Handy, for the Shop Office 3194
Rubber Tube Protects Ignition Distributor of Auto Engine 3128
Ruler, Dot and Dash, Easily Made...... 3214
Rulers, Weighted, Keep Drawings from Rolling When in Use 3161
Ruling Pen, Spring-Opening Lock Fitted on 3296
Ruling Pens, Using Fountain-Pen Filler to Fill 3236
Running Board on Automobile Strengthened by Brace 3246
Rusted Engine Pistons, Loosening with Hot Water 3120
"Rusted-In" Screws, Moving 3267

Safe, Fireproof Concrete, How to Make 3206
Safety Pin, Carry Tool Checks on...... 3267
Safety Pin Makes Good Picture Hook... 3212
Safety Tool Extracts Particles from the Eye 3239
Safety Washer for Fastening Emery Wheels 3177
Salt in Whitewash 3287
Sand, Deep, Starting Auto in.......... 3290
Sand Furnace for House Heating Conserves Coal 3209
Sand-Blast Operators, Air-Bellows Device Protects 3137
Sandblast, Etching on Glass and Metal with 3266
Sandpaper Block for Use on Curved Surfaces 3168
Sandpaper, Files Made of, Handy in Woodwork 3151
Sandpaper Held Firmly on Block by Its Tapered Shape 3257
Sandpaper Prevents Slipping of Work in Miter Box 3118
Sanitary Kitchen Cabinet, How to Make 3227
Sashes, Fastening Fly Screens in, with Stove Bolts 3158
Save Coal by Burning Ashes............ 3255
Saving Fuel in Plant Which Burns Oil 3248
Saving Fuel on the Gas Range......... 3282
Saving Gas in Heating Water.......... 3287
Saving on Typewriter Ribbons, Simple Method of 3202
Saw Filing, Guideboards Are Great Aid for Correct 3179
Saw, Rip, Groove Plane Made from.... 3271
Saw, Sharpening a Worn-Down........ 3286
Saw-Tooth Design, Sanitary Hog House of 3149
Sawdust, Stove That Burns............ 3290
Sawing Softer Materials Sheet-Metal Backing Helps When 3253
Sawing through Plaster Walls.......... 3277
Scaffolding without Nails 3268
Scarecrow with Moving Hands......... 3299
Scissors Blades, Rod for Holding While Polishing 3185
Scored Cylinder Repaired by Soldering 3285
Scraper Blades, Clamping Block for Filing 3258
Scraper Blades, Handle for............. 3281
Scraper Edges, Good and Bad.......... 3300
Scraper, Flexible, Makes Difficult Jobs Easy 3191
Scraper Handle, Convenient Homemade 3161
Scraping Babbitt Bearings to a Nice Fit 3112
Screenings, Soft-Coal, Using with Anthracite 3257
Screw and Centrifugal Type Pumps Work Together 3270
Screw Clip, Old Metal, Gear Puller Cheaply Made from 3204
Screw Eyes Carry Padlock.............. 3287
Screw, Lag, Setting in a Hole Containing a Broken Point.................... 3187
Screw-Machine Products, Tank for Cleaning 3174
Screwdriver, Emergency Handle for.... 3224
Screwdriver Handle Made of Dust Cap from Tire Valve........................ 3258
Screwdriver Head, Self-Centering Nonslipping 3193
Screwdriver, Making Magnetic.......... 3301
Screwdriver, Triple-Bladed Pocket..... 3183
Screws, Holding While Threading or Turning Them 3267
Screws, Loosening Rusty Wood......... 3185
Screws, Moving "Rusted-In" 3267
Screws, Wood, Making Hold When Parallel to Grain 3273
Scriber, Locating Bolt Holes Where Same Cannot be Used................. 3245
Sections, Easily Detached, Portable Fence Formed of 3295
Seed Corn, Testing for Germination.... 3288
Segment-Joining Jig for the Home Workshop 3202
Self-Alining, Making a Sprung Shaft... 3188
Self-Centering Nonslipping Screwdriver Head 3193
Self-Chalking Line and Reel............ 3102
Self-Closing Gate Hinge, Springless..... 3283
Self-Lighting Gas-Soldering Torch..... 3190
Self-Raising Box Bottom Aids in Obtaining Contents 3234
Serial-Number Identifications on Working Drawings Save Time............. 3131
Set Pulleys, Worn Loose Pulleys Replaced by Adjoining.................... 3109
Setscrew Loosening, Overcoming 3202
Setscrews in Dogs Attached to Lathe, Wrench for 3253
Setting a Lag Screw in a Hole Containing a Broken Point 3187
Shaft, Collar for Flue-Cutter Slip-Joint 3194
Shaft, Sprung, Making Self-Alining.... 3188
Shafting Hangers Converted into Neat Bench Buffer 3277
Shafts without End Centers, Attachment Adapts Tachometer for.......... 3127
Shanks, Tap Wrench Fits Various Sizes of 3099
Shape, Proper, to Cut a Shim or Filler.. 3217
Sharpening a Worn-Down Saw........ 3286
Sharpening All Sizes of Gouges, Revolving Cone for 3129
Sharpening, Carpet Pad for Wood Planes Saves Frequent 3130
Shears, Bench Snips or 3271
Sheet-Metal Backing Helps When Sawing Softer Materials 3253
Sheet Metal, Cutting Disks or Rings Accurately from 3162
Sheet-Metal Pieces, Small, Jig for Drilling 3177
Sheet Metal, Power-Punching or Drilling, Spacing Gauge for 3173
Shelf, Chair, That Folds Out of the Way 3210
Shellac Gives Protection against Wear 3216
Shield on Creeper Protects Face When Working under Auto 3148
Shield, Soldering-Iron, Protects Hand from Dripping Solder 3160
Shim or Filler, Proper Shape to Cut... 3217
Shim, Paper, Makes Worn Taper Grip Tightly 3221
Shoe Shining at Home Made Easy by Handy Outfit 3276
Shop-Call System, Colored-Light Electrical 3197
Shop, Check-Out Board Helps Locate Mechanics in 3096
Shop, Discarded Circular Saw Forms Loud Bell for Use in 3250
Shop Material-Checking Work, Handy Writing Board for 3170
Shop Office, Handy Rubber-Stamp Ink Pad for 3194
Shop, Oil Filter and Tank for.......... 3119
Shop or Laboratory, Small Electric Furnaces for 3105
Shop, Pocket Mirror Useful in.......... 3278
Shop, Portable Tool Chest and Workbench is Easily Moved about......... 3186
Shop Truck That may be Picked Up by Crane 3220
Shop Use, Home or, Simple Pipe Bender for 3169
Shop Use, Strong and Inexpensive Desk Made for 3104

Shop Ventilation, Small, Draft-Proof Window for 3169
Shop Water Heater, Old Auto Radiator Converted into 3107
Shops, Small, Foot-Power Hammer for Use in 3165
Shoveling, Heavy, Lever-and-Fulcrum Snow Shovel Makes Easy 3256
Shovels, Theft of Prevented by Chain and Padlock 3116
Shut-Off, Automatic, for Filling Cans or Buckets 3231
Sidewalks, Concrete, Folding Square for Dividing 3197
Sign Reading "No Admittance," Door Latch Operated by 3301
Signaling Device, Automatic, for Projecting Machines 3178
Signboard Shows Where Workman is to be Found 3259
Signs, Good, How to Make without Special Skill 3222
Signs on Idle Machinery Give Reasons for Delay in Production 3125
Siphon That is Easily Kept Primed..... 3109
Size for Holding Aluminum Bronze Letters 3210
Skill, Special, How to Make Good Signs without 3222
Slap, Enlarging Pistons by Peening to Eliminate 3272
Slate Instrument Panel, Broken, Repaired with Angle Iron 3146
Sliding Door, Swinging Door in Saves Employes' Time 3193
Sliding Drawers, Lubricated Varnish Eliminates Trouble with 3260
Slipping of Work in Miter Box, Sandpaper Prevents 3118
Slot in Hard Casting, Novel Method of Machining 3144
Small Drafting Work Easily Done without a T-Square 3291
Small Pieces, Convenient Electroplating Rack for 3208
Smokestacks, Factory, Blasting Soot from 3154
Snap Bow Aids in Making Chalk Lines.. 3207
Snout Snare Makes It Easy to Ring Hogs 3225
Snow Scraper Made from Rake.......... 3253
Snow Shovel, Lever-and-Fulcrum, Makes Heavy Shoveling Easy 3256
Soap Dish Made from End Cap of Roofing Rolls 3237
Soapy Water, Oil Conserved by Using.. 3169
Socket, Improvised Electric-Light..... 3175
Soft-Coal Fire, Large Kettle Inverted over Saves Heat 3267
Soft-Coal Screenings, Using with Anthracite 3251
Softening Hard Iron and Brass Castings 3190
Softer Materials, Sheet-Metal Backing Help When Sawing 3253
Solder, Dripping, Soldering-Iron Shield Protects Hand from 3160
Solder, Mold for, Easily Made of Plaster of Paris 3219
Solder Paste for Difficult Fluxing...... 3184
Soldering Electrically without an Iron.. 3106
Soldering Iron, Asbestos Hood for..... 3292
Soldering Iron for Attachment to Blowtorch 3217
Soldering-Iron Shield Protects Hand from Dripping Solder 3160
Soldering Paste Carried on Torch...... 3273
Soldering, Scored Cylinders Repaired by 3285
Soldering Torch, Self-Lighting Gas.... 3190
Soldering Torch, Tire Used to Furnish Pressure for 3133
Solution for the Removal of Paint...... 3186
Soot, Blasting from Factory Smokestacks 3154
Sorting Hopper for Berries and Small Vegetables 3123
Spacing Gauge for Power-Punching or Drilling Sheet Metal 3173
Spark-Plug Atomizer Starter for Automobile Engines 3213
Spark-Plug Gap, Coin is Handy Gauge for 3118
Spark Plug, Lighter for Gas Torch Made from 3295
Spark-Plug Repair, Emergency.......... 3177
Speed, High, Adjustable Valve-Spring Tension Adapts Motorcycle for....... 3132
Speed Up Production, Wedge-Clamp Jig Helps 3230
Sphere Attachment for Dividers When Measuring from Holes 3168
Spikes, Two, Temporary Pole Step Made from 3244
Splicing, Calculating Belt Lengths for..3245
Splicing Stranded Wire 3280
Spline Weights, Fingers for Holding in Drafting 3211
Splitting Wood, Preventing Nails from 3261
Spout, Clogged, Readily Cleaned with Hose 3232
Sprayer or Air Brush Easily Made from Common Materials 3208
Spring End Bearings Overcome Play in Auto Drive Shaft 3134
Spring Lock, Simple Belt Shifter with.. 3131
Spring-Opening Lock Fitted on Ruling Pen 3296
Spring Wire, Compressing While Bending Preserves Strength 3260
Springless Self-Closing Gate Hinge..... 3283
Springs, Auto and Wagon, Paraffin Grease for 3217
Springs, Spiral, Device for Winding on a Lathe 3198
Square Attachment, Handy, for Laying Out Stairs 3202
Square, Bevel, for Door and Window Fitting 3206
Square, Folding, for Dividing Concrete Sidewalks 3197
Square, Handsaw Fitted with Attachment for Use as 3251
Square-Point Center Punch Handy for Revising Marks 3108
Stable, Concrete Ventilating System for 3241
Staining Wood a Dark Color with Roofing Cement 3270
Stairs, Handy Square Attachment for Laying Out 3202
Stairway, Disappearing 3275
Stamp, Inspector's, Built into Hammer.. 3297
Stand, Disk Bearing, for Balancing Rotary Machine Parts 3128
Staple Prevents Manipulation of Lock.. 3302
Starter, Spark-Plug Atomizer, for Automobile Engines 3213
Starting Auto in Deep Sand.......... 3290
Steam-Engine Cylinder, Device for Vulcanizing Tires on.......... 3171
Steam, Exhaust, Mechanic's Clothes Laundered by 3279
Steam Jet to Thaw Frozen Water Pipes 3240
Steam, Locomotive, Used to Clean and Sterilize Well 3183
Steam, Removing Wall Paper with...... 3291
Steam Whistle Made from Pipe Fittings 3279
Steel, Bar, One-Piece Pipe Wrench Made from 3243
Steel, Hardened, Etching a Hole through 3139
Steel, High-Speed, Tool for Conserving Small Pieces of 3176
Steel Lever and Wheel Handles, Tin-Coating 3187
Steel Plates, Rigging Lessens Work of Drilling Holes in 3134
Steel, Sheet, Small Bevel Square Made from 3224
Steel, Using High-Speed for Hand Punches 3241
Steelyard Scales, Useful Platform for Weighing Sacks on 3187
Steering Column, Automobile, Flash Light on 3229
Steering Wheel, Automobile, Electric Hand Warmer for 3282
Stepladder and Portable Elevator, Combination 3181
Stepladder, Adjustability of Big Blackboard Makes Needless 3120
Steps, Door Latch Controlled from Kitchen Saves Many 3230
Sterilize Well, Locomotive Steam Used to Clean and 3183
Stethoscope for Telephone and Automobile Use 3161
Sticking to Perforator, Keeping Small Punchings from 327

Stock Bins Built Up from Boxes as Units 3109
Stock, Polished Round, Handle for Holding for Drilling 3187
Stock Rooms, Movable Posts Made of Pipe Useful in 3284
Stones, Heavy, Moving into Place on a Wall 3249
Stop Block, Auto, Reduced to Efficiency 3296
Stop on Faucet Avoids Oil Leakage..... 3291
Storage, Convenient, Outside Coal Bin Provides 3229
Storage Space, Old Cistern Remodeled as 3123
Storing Air Hammers in Oil Improves Working Quality 3212
Stove Bolts, Fastening Fly Screens in Sashes with 3158
Stove, Kerosene Burner or, Readily Made 3244
Stove, Small Truck Aids in Moving.... 3268
Stove That Burns Sawdust............. 3290
Straightedge, Utilizing Sun's Rays for Truing 3188
Straining Cloth, Clips for Holding over Can or Container 3124
Stranded Wire, Splicing 3280
Streams, Crossing, Auto Air Intake Guarded for 3164
Strength, Compressing Spring Wire While Bending, Preserves 3260
Substantial Flagpole 3292
Substitute for Jackscrew, Adjustable Supporting Stand is 3178
Suitcase, Mechanic's Tool Case Made from 3226
Summer and Winter Use, Doors Have Removable Panels for 3206
Sun's Rays, Utilizing for Truing a Straightedge 3188
Supply Pipe, Cold-Water System with Cooling Coil in 3180
Support for Garage "Free-Air" Hose at Curbing 3114
Supporting Stand, Adjustable, Substitute for Jackscrew 3178
Surveyor's Data, Device for Mapping... 3104
Surveyors' Tape, Homemade Pistol Grip for 3114
Surveyor's Tripod Level Made Quickly from Carpenter's Level 3196
Suspension Heating Device for Small Utensils 3147
Swinging Door in Sliding Door Saves Employees' Time 3193
Swinging Elevator for Trunks and Light Freight 3293
Switch, Motor-Starting and Regulating. 3153
Switch, Pedal, for Emery-Wheel Motors 3264
Switch Reversed by Tilting Mercury Cups 3242
Swivel Chair Made from Wagon-Wheel Fellies 3255
Swivel Jaw for Holding Wedge-Shaped Articles in Vise 3164

T-Square for Vertical Boards, Easy-Running 3223
T-Square, Small Drafting Work Easily Done without 3291
Table, Invalid's, Rests on Bed........... 3299
Table or Bench, Adjustable Leg for.... 3096
Tachometer for Shafts without End Centers, Attachment Adapts.............. 3127
Tack Hammer, Magnetic, Is Electrically Operated 3146
Tags, Good Marking, Old Linen Collars Make 3287
Tailstock Centers, Removing Easily by Means of Drift Pin...................... 3219
Tank, Elevated, Gauge Tells Height of Water in 3224
Tank for Cleaning Screw-Machine Products 3174
Tanks, Auto-Body Panels and, Removing Dents in 3140
Tap, Chalking to Get a Perfect Fit..... 3180
Tap, Tapping a Hole without.......... 3210
Tap Wrench Fits Various Sizes of Shanks 3099
Tape, Electricians', Renewing Old....... 3256
Tape Lines, Tool for Holding in Corners 3189
Tapeline Holder, Quick-Releasing, does not Snag Readily 3155
Taper, Worn, Paper Shim Makes Grip Tightly 3221
Tapered Shape, Sandpaper Held Firmly on Block by Its........................ 3257
Tapping a Hole without a Tap......... 3210
Taps and Reamers, Method of Milling Flutes in 3186
Taps, Blocks for Starting Squarely.... 3136
Targets, Lead "German Soldiers" Used as 3282
Tee Wrenches, Large, File Handles Convenient on 3119
Teeth, Broken, Using Hacksaw Blades with 3229
Teeth, Patching into Broken Gears..... 3117
Telephone and Automobile Use, Stethoscope for 3161
Telephone Cables, Aerial, Apparatus for Locating Trouble in 3101
Templates, Large Jigs and, Painted Red for Identification 3113
Tenons, Rapid and Accurate Method of Making 3170
Tension, Adustable Valve-Spring, Adapts Motorcycle for High Speed.......... 3132
Terminals, Method of Protecting from Moisture 3139
Temporary Pole Step Made from Two Spikes 3244
Test, Simple, to Distinguish Wood Alcohol from Denatured Alcohol.......... 3157
Testing Compression in Cylinders of Automobile Motor 3110
Testing Knife-Switch Contact Blades... 3142
Testing Motor Journal Bearings, Efficient Method of 3173
Testing Oil Level in Automobile Crank Cases 3220
Testing Seed Corn for Germination..... 3288
Tether, Safety Radial, for Animals..... 3233
Thaw Frozen Water Pipes, Steam Jet to 3240
Theft of Shovels Prevented by Chain and Padlock 3116
Thermometer for Water-Cooling System of Motor Car 3160
Thermometers Save Coal in Small Plant 3250
Thousandth of an Inch, The........... 3281
Thread Tool, Accurate Method of Setting in Lathe 3095
Threaded Holes, Drill for Enlarging the Bottom of 3155
Threaded Parts, Small, Tray for Moving without Injury 3167
Threading and Fitting Long Pipes, Hook Supports for 3138
Threading Die Made from a Nut........ 3246
Threading or Turning Screws, Holding While 3267
Threads of a Pump Cylinder, Buggy Hub Used for Repairing Worn 3180
Threads on Bolts, Serviceable Tool for Cleaning 3200
Three-Way Hand Clamp Has Many Uses 3144
Tightening Bolts Quickly with Brace, Device for 3129
Tile, Mole Plow Makes Subsurface Drain without Use of 3182
Time, Employes', Swinging Door in Sliding Door Saves 3193
Time, Serial-Number Identifications on Working Drawings Save 3131
Timesaving Device to Open and Close Cellar Windows 3232
Timesaving Magazine Fuse Box for Experimental Circuits 3218
Tin-Coating Steel Lever and Wheel Handles 3187
Tin Foil Winding on Bulb Intensifies Electric Light 3096
Tin Guards for Edges of Chisels........ 3137
Tire Remover, Serviceable, for Cars Equipped with Split Rims............... 3172
Tire Used to Furnish Pressure for a Soldering Torch 3133
Tire Valve, Rubber Cement for Repairing 3295
Tire Valve, Screwdriver Handle Made of Dust Cap from 3258
Tires, Device for Vulcanizing on Steam-Engine Cylinder 3171
Tires, Inflating with Air by Use of City Water Pressure 3169
Tombstone, Homemade Concrete........ 3281

Tongs, Electric-Soldering 3272
Tool, Adjustable Counterboring, Has Many Applications 3168
Tool Block for Making Small Pins on Lathe 3107
Tool Box, Bit Brace Makes Excellent Handle for 3243
Tool Case, Mechanic's, Made from a Suitcase 3226
Tool Checks, Carry on a Safety Pin.... 3267
Tool Chest and Workbench, Portable, is Easily Moved about the Shop........ 3186
Tool-Chest Tray Rises When Lid is Opened 3278
Tool Drawer, Portable.............. 3282
Tool for Conserving Small Pieces of High-Speed Steel 3176
Tool for Cutting Thin Brass Washers.. 3198
Tool for Holding Polished Metal Parts in Machine Operations 3103
Tool for Holding Tape Lines in Corners 3189
Tool for Laying Out Keyways.......... 3193
Tool for Lifting Rocker Arms on Overhead-Valve Engines 3260
Tool for Machining Bosses and Hubs on Drill Press 3130
Tool for Packing Wires in Slots of Motor Fields 3096
Tool for Removing and Applying Fuse Blocks Safely 3140
Tool for Removing Step-Cut Piston Rings 3140
Tool Grinding, Small Piece of Glass Useful in 3254
Tool, Handy, Drives Small Nails into Hard Wood 3156
Tool, Holder and Pick-Up, for Cotter Pins 3242
Tool, Homemade, Round Recesses Easily Cut with 3156
Tool, Serviceable, for Cleaning Threads on Bolts 3200
Tool, Serviceable Homemade, for Trimming Belts 3188
Tool Steel, Reducing Waste in Breaking 3188
Tool Trays, Creeper for Use under Vehicles is Provided with.............. 3153
Tools and Gears, Neat Chest Under Lathe Holds 3273
Tools, Brass Scraper for Cleaning...... 3212
Tools, Draftsman's, Handy Rack Holds. 3254
Tools, Flat, Rack for.............. 3118
Tools for Handling Electric Globes without a Ladder 3146
Tools, Handy Electrician's, Made from Old Hacksaw Blades 3165
Tools, Heavy, Counterweights on Portable Drills and 3228
Tools, Methods of Holding in Lathe Boring Bars 3200
Tools, Pliers and Other, Insulating Handles for 3283
Tools, Woodworking, Paraffin for...... 3155
Top, Lighting Fire at, Saves Fuel...... 3284
Torch, Soldering Paste Carried on...... 3273
Torque Rod, Lubricating Bolt of a Ball Thrust on 3138
Towel-Rack Improvement Keeps Articles in Place 3137
Tracings, Mending Torn.............. 3148
Tractor, Emergency Bearing for, Made from Oil-Soaked Maple.............. 3176
Tractor, Extension Control for, Aids in Work of Plowing 3175
Tractor, Novel Method of Getting Out of a Mud Hole 3172
Transformers, Small, Improvement for Electric Bells Having.............. 3122
Tray for Moving Small Threaded Parts without Injury 3167
Tray, Tool-Chest, Rises When Lid is Opened 3278
Tree, Big, How Moved.............. 3290
Triangle, Draftsman's, with Raised Points or Feet 3296
Triangle, Draftsman's, Useful Kinks for Improving 3277
Triple-Bladed Pocket Screwdriver...... 3183
Tripod Level, Surveyor's, Made Quickly from Carpenters' Level 3196
Trimming Belts, A Serviceable Homemade Tool for 3188
Trouble in Aerial Telephone Cables, Apparatus for Locating..............
Truck, Crane at Rear of Helps Load and Unload ....
Truck, Hand, and Light Car, Load of Lumber Hauled by ....
Truck, Hand, Hook Fitted to Hold Boxes ....
Truck, Loading, Facilitates Handling of Auto Chassis ....
Truck, Shop, That may be Picked Up by Crane ....
Truck, Small, Aids in Moving Stove ..
Truck, Unloading a Heavy Machine from
Truck, Winch, for Piling and Loading Boxes ....
Truck with Lifting Platform and Cradle for Auto Motors..............
Trucks, Reliable Oiling System for Chain-Driven ....
Truing a Straightedge, Utilizing Sun's Rays for ....
Truing the Faces of Nuts, Mandrel for..
Trunks and Light Freight, Swinging Elevator for ....
Tube, Flexible, Blowtorch with, for Work in Close Spaces..............
Tube or Casting, Electroplating the Inside of ....
Tubes, Collapsible, Keeping Inverted Prevents Contents Drying Out......
Tubing and Castings, Burrs inside of Removed by File in Chuck........
Tubing, Device for Making Bell Ends on ....
Tubing, Lathe Bell Center for Turning..
Tumbler, Barrel, for Punch Shop or Foundry ....
Turning a Fifty-Four-Inch Wheel on a Nineteen-Inch Lathe ....
Turning or Threading Screws, Holding While ....
Turning Tubing, Lathe Bell Center for.
Twine Cutter, Handy, Made from a Wood Screw ....
Twine Holder and Cutter, Handy.....
Twist Drill, Ordinary, Reaming Large Holes with ....
Type Gauge, Economical ....
Typewriter Ribbons, Simple Method of Saving on ....

Universal Lathe Chuck Used as a Vise.
Unloading a Heavy Machine from a Truck ....
Utensils, Small, Suspension Heating Device for ....

V-Block, Angle Pieces Shaped in with Arbor Press ....
V-Type Engines, Lubricating Piston Pins on ....
Valve Grinder Made from Washer..
Valve-Grinding Jobs, Useful Kink for..
Valve Guides in Auto Engines, R[illegible]
Vegetables, Small, Sorting Hopper for Berries and ....
Vehicles, Creeper for Use under is Provided with Tool Trays..............
Veining Tool, Improvised ....
Ventilating System, Concrete, for Stable
Ventilation, Small-Shop, Draft-Proof Window for ....
Vertical-Drum Windlass Made of Old Barrel ....
Vessel for Cooking Potatoes for Hogs on the Farm ....
Vise and Breast Drill Used as a Substitute Drill Press ....
Vise Ball Point, Friction Lock Keeps from Injuring Fingers ....
Vise, Bench, Making a Punch-and-Die Attachment for ....
Vise or Wrench Tool, Handy, for Bench Use ....
Vise, Swivel Jaw for Holding Wedge-Shaped Articles in ....
Vise, Universal Lathe Chuck Used as..
Vulcanizing Tires on Steam-Engine Cylinder, Device for ....

Wagon Springs, Auto and, Paraffin Grease for ....

Wagon-Wheel **Fellies, Swivel Chair** Made from ... 3256
Wagon Wheels Provide Forms for Concrete Culvert ... 3108
Wall, Moving Heavy Stones into Place on ... 3249
Wall of Kitchen, Wood Box Built into.. 3249
Wall Paper, Removing with Steam..... 3291
Walls, Plaster, Sawing through........ 3277
War-Time Efficiency Methods Applied to the Dairy Barn... 3163
Warning, Car Leaving Garage Automatically Gives ... 3232
Warping, Hardening Long, Thin Pieces without ... 3300
Washbowls, Foot Control Handy for Faucets in ... 3264
Washer, Quick and Convenient Blueprint ... 3207
Washer, Safety, for Fastening Emery Wheels ... 3177
Washer, Valve Grinder Made from..... 3297
Washers and Packings, Homemade Machine for Cutting ... 3144
Washers, Lock, Easily Made............ 3263
Washers, Rack for ... 3272
Washing Off Pencil Tracings after Blueprinting Saves Cloth... 3145
Waste in Breaking Tool Steel, Reducing 3188
Waste Materials, Handy Clamp Made from ... 3171
Water-Cooling System of Motor Car, Thermometer for ... 3160
Water Gasket, Auto Radiator, Altered for Winter Operation ... 3108
Water Heater, Gas, Controlled by Electricity ... 3238
Water-Heater Outfit, Portable, Made from a Barrel ... 3199
Water Heater, Shop, Old Auto Radiator Converted into ... 3107
Water in Elevated Tank, Gauge Tells Height of ... 3224
Water Jacket, Cracked, Repairing with Cement ... 3284
Water Jacket on Engine, Cracked, Novel Repair for ... 3127
Water-Jacketing an Air-Cooled Motor.. 3189
Water Levels, Hydraulic Pump is Independent of ... 3135
Water Pipes, Steam Jet to Thaw Frozen 3240
Water Pressure, City, Inflating Tires with Air by Use of... 3169
Water, Saving Gas in Heating.......... 3287
Water Supply, Device Regulates Windmill to Maintain ... 3099
Water-Supply Reservoir, Small, Built in Mountain Stream ... 3117
Water Trough, Keeping from Freezing.. 3248
Wax for a Dance Floor, How to Make.. 3202
Wear, Shellac Gives Protection against. 3216
Wear,. Weight and Pulleys Keep Air Hose Convenient and Reduce........ 3266
Web, Cracked, Emergency Repair for a Crankshaft with ... 3263
Wedge-Clamp Jig Helps Speed Up Production ... 3230
Wedge-Shaped Articles, Swivel Jaw for Holding in Vise ... 3164
Weighing Machine, Automatic, Electrically Operated ... 3125
Weighing Sacks on Steelyard Scales, Useful Platform for ... 3187
Weight and Pulleys Keep Air Hose Convenient and Reduce Wear... 3266
Weighted Rulers Keep Drawings from Rolling When in Use... 3161
Welding Mask Made from a Metal Bucket ... 3126
Well, Locomotive Steam Used to Clean and Sterilize ... 3183
Wet, Keep Coal ... 3249
Wheel, Automobile, Effective Emergency Repair for ... 3182
Wheel, Fifty-Four-Inch, Turning on a Nineteen-Inch Lathe ... 3160
Wheelbarrow, Small Wheels Aid Handling of ... 3217
Wheels, Automobile, Removing with the Hub Cap ... 3244
Wheels, Small, Aid Handling of Wheelbarrow ... 3217
Wheels, Wagon, Provide Forms for Concrete Culverts ... 3108
Whistle, Steam, Made from Pipe Fittings 3279
Whitewash, Salt in ... 3287
Winch Truck for Piling and Loading Boxes ... 3111
Winding Spiral Springs on a Lathe, Device for ... 3198
Windlass, Old Automobile Brake Adapted for Use on... 3192
Windlass, Vertical-Drum, Made of Old Barrel ... 3095
Windmill to Maintain Water Supply, Device Regulates ... 3099
Window Carriage and Track, Blueprinting Frame Has ... 3122
Window, Draft-Proof, for Small-Shop Ventilation ... 3169
Window Fitting, Door and, Bevel Square for ... 3206
Window Panes, Handy Wire Hook for Carrying ... 3259
Window Shades, Divided, Permit Fine Adjustment of Light... 3261
Windows, Cellar, Timesaving Device to Open and Close... 3232
Winter and Summer Use, Doors Have Removable Panels for... 3206
Winter, Draining Pipes in an Unoccupied House for ... 3234
Winter Operation, Auto Radiator Water Gasket Altered for ... 3108
Wire Hook, Handy, for Carrying Window Panes ... 3259
Wire Soldered over Mouth of Pail Saves Paint ... 3147
Wire, Splicing Standard ... 3280
Wire, Spring, Compressing While Bending Preserves Strength ... 3260
Wire-Stripping Bench Tool, Pedal-Control ... 3113
Wire Used to String Rings as They Come from Lathe ... 3205
Wires across Barrel Heads Give Protection ... 3297
Wires, Heavily Laden Fruit Trees Braced with ... 3172
Wires, Tool for Packing in Slots of Motor Fields ... 3096
Wiring, Emergency Call-Bell System Has Permanent ... 3294
Wiring Finished Houses, Magnetic Locator Useful in ... 3300
Wood Alcohol, Simple Test to Distinguish from Denatured Alcohol... 3157
Wood Box Built into Wall of Kitchen.. 3249
Wood Inserts in Pulley Bushing Conduct Oil ... 3120
Wood Planes, Carpet Pad for, Saves Frequent Sharpening ... 3130
Wood, Preventing Nails from Splitting 3261
Wood, Reamer for Accurate Work in... 3173
Wood Screw, Handy Twine Cutter Made from ... 3159
Wood Screws, Making Hold When Parallel to Grain ... 3273
Wood, Selecting to Take an Ebony Finish ... 3174
Wood Shop, Pneumatic Riveter Useful in 3215
Wood, Simple Depth Gauge for Blind Holes in ... 3197
Wood, Staining a Dark Color with Roofing Cement ... 3270
Wood-Turning Lathe, Using the Drill Press as ... 3132
Wooden Caps Convert Machinist's Vise into Bench Clamp ... 3158
Wooden Knitting Needles and Dowel Pins, Hollow Mill for Making... 3190
Woodwork, Emergency Corrugated Fasteners for Use in ... 3159
Woodwork, Files Made of Sandpaper Handy in ... 3151
Woodworkers' Clamp, Compressing Stiff Clutch Springs with ... 3264
Woodworking Tools, Paraffin for....... 3155
Work, Bench Stop Which Clamps...... 3271
Work, Clamp Holds Down on Top of Bench ... 3246
Work in Cramped Spaces, Ratchet Brace Remodeled for ... 3242

Workbench, Bending Conduit Easily at. 3226
Workbench, Portable Tool Chest and, is Easily Moved about the Shop........ 3186
Working Drawings, Serial-Number Identifications on Save Time.......... 3131
Working Quality, Storing Air Hammers in Oil Improves 3212
Workman, Signboard Shows Where He is to be Found....................... 3259
Workshop, Home, Dowel Cutter for.... 3154
Workshop, Home, Segment-Joining Jig for 3202
Worn-Down Saw, Sharpening 3286
Wrench, Improvised Electromagnet Picks from Crankcase............... 3276
Wrench Tool, Handy Vise or, for Bench Use 3162
Writing Board, Handy, for Shop Ma-
Wrench for Setscrews in Dogs Attached to Lathe 3253
Wrench for Small Polished Pipes...... 3204
Wrench, One-Man, for Automobile Crank-Case Bolts 3207
terial-Checking Work 3170

POPULAR MECHANICS SHOP NOTES

For 1919

Vol. XV

50¢

EASY WAYS TO DO HARD THINGS

POPULAR MECHANICS
CHICAGO

PMCo.

POPULAR MECHANICS SHOP NOTES

For 1920

Vol. XVI 50¢

EASY WAYS TO DO HARD THINGS

POPULAR MECHANICS
CHICAGO

PMCo.

POPULAR MECHANICS SHOP NOTES

For 1920

Vol. XVI

50¢

EASY WAYS TO DO HARD THINGS

POPULAR MECHANICS
CHICAGO

POPULAR MECHANICS

Shop Notes Series

OF YEAR BOOKS

One of these books is issued the first of each year, and is a reprint of all the articles which have been published during the year past in our "Shop Notes Department"

200 Pages	Vol. I,	"Shop Notes for 1905"	385 Illustrations
228 Pages	Vol. II,	"Shop Notes for 1906"	555 Illustrations
228 Pages	Vol. III,	"Shop Notes for 1907"	580 Illustrations
212 Pages	Vol. IV,	"Shop Notes for 1908"	536 Illustrations
224 Pages	Vol. V,	"Shop Notes for 1909"	461 Illustrations
224 Pages	Vol. VI,	"Shop Notes for 1910"	451 Illustrations
224 Pages	Vol. VII,	"Shop Notes for 1911"	468 Illustrations
224 Pages	Vol. VIII,	"Shop Notes for 1912"	510 Illustrations
224 Pages	Vol. IX,	"Shop Notes for 1913"	503 Illustrations
224 Pages	Vol. X,	"Shop Notes for 1914"	462 Illustrations
224 Pages	Vol. XI,	"Shop Notes for 1915"	517 Illustrations
224 Pages	Vol. XII,	"Shop Notes for 1916"	469 Illustrations
224 Pages	Vol. XIII,	"Shop Notes for 1917"	422 Illustrations
224 Pages	Vol. XIV,	"Shop Notes for 1918"	344 Illustrations
224 Pages	Vol. XV,	"Shop Notes for 1919"	464 Illustrations
224 Pages	Vol. XVI,	"Shop Notes for 1920"	485 Illustrations
224 Pages	Vol. XVII,	"Shop Notes for 1921"	495 Illustrations
224 Pages	Vol. XVIII,	"Shop Notes for 1922"	465 Illustrations
224 Pages	Vol. XIX,	"Shop Notes for 1923"	436 Illustrations

These books are a perfect gold mine of information for every one interested in mechanics, or who uses tools for pleasure or as an occupation. Of equal value and help to the professional mechanic and the amateur. These articles are the cream of the experience of years of hundreds of the most successful mechanics in the country. There is nothing on the market equal to these books at five times their price. The Popular Mechanics Shop Notes Series **tells easy ways to do hard things,** and like Popular Mechanics, is "Written so you can understand it." These books are indexed very fully and with great care.

The subjects treated cover every department of mechanics, with useful time saving "kinks" for engineers, firemen, carpenters, machinists, plumbers, painters, iron and wood workers, electricians of all kinds, masons and in fact all the trades.

"Worth Its Weight in Gold" is a frequent expression from our readers, and one young mechanic in the far west who started a repair shop for himself, says he owes his success to "Popular Mechanics Shop Notes." Many a time when a customer brought in a job new to him, he consulted his "Shop Notes," which told him how to do it.

Each volume contains entirely different matter from that published in the others. A set of these books covering several years will make an encyclopedia of priceless value to the owner.

Price (Heavy Bristol Cover) 50 Cents Per Volume, Postpaid

Shop Notes Series of 19 Volumes

Contain 10,000 articles, 4228 pages and 9062 illustrations

Order through your dealer or direct from the publishers

POPULAR MECHANICS BOOK DEPT.
200 E. Ontario St., CHICAGO

*Vol. XI, Shop Notes for 1915 is also bound in cloth at $1.00 postpaid.

P M Co.